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| APPLICATION NUMBER | FILING/RECEIPT DATE | FIRST NAMED APPLICANT | ATTORNEY DOCKET NO./TITLE |
|--------------------|---------------------|-----------------------|---------------------------|
|--------------------|---------------------|-----------------------|---------------------------|

09/001,737 12/31/97 MIZZEN

L 870109.408

0252/0414

SEED AND BERRY  
6300 COLUMBIA CENTER  
701 FIFTH AVENUE  
SEATTLE WA 98104-7092

NOT ASSIGNED

1643

DATE MAILED:

04/14/98

**NOTICE TO COMPLY WITH REQUIREMENTS FOR PATENT APPLICATIONS  
CONTAINING NUCLEOTIDE SEQUENCE AND/OR AMINO ACID SEQUENCE DISCLOSURES**

The nucleotide and/or amino acid sequence disclosure contained in this application does not comply with the requirements for such a disclosure as set forth in 37 CFR 1.821 - 1.825 for the following reason(s):

- ☒ 1. This application fails to comply with the requirements of 37 CFR 1.821 - 1.825.
- ☒ 2. This application does not contain, as a separate part of the disclosure on paper copy, a "Sequence Listing" as required by 37 CFR 1.821(c).
- ☒ 3. A copy of the "Sequence Listing" in computer readable form has not been submitted as required by 37 CFR 1.821(e).
- ☐ 4. A copy of the "Sequence Listing" in computer readable form has been submitted. However, the content of the computer readable form does not comply with the requirements of 37 CFR 1.822 and/or 1.832, as indicated on the attached marked-up copy of the "Raw Sequence Listing."
- ☐ 5. The computer readable form that has been filed with this application has been found to be damaged and/or unreadable as indicated on the attached CRF Diskette Problem Report. A substitute computer readable form must be submitted as required by 37 CFR 1.825(d).
- ☐ 6. The paper copy of the "Sequence Listing" is not the same as the computer readable form of the "Sequence Listing" as required by 37 CFR 1.821(e).
- ☐ 7. OTHER:

**APPLICANT MUST PROVIDE:**

- ☒ An initial or substitute computer readable form (CRF) copy of the "Sequence Listing."
- ☒ An initial or substitute paper copy of the "Sequence Listing," as well as an amendment directing its entry into the specification.
- ☒ A statement that the content of the paper and computer readable copies are the same and, where applicable, include no new matter, as required by 37 CFR 1.821(e), 1.821(f), 1.821(g), 1.825(b) or 1.825(d).

**FOR QUESTIONS REGARDING COMPLIANCE WITH THESE REQUIREMENTS, PLEASE CONTACT:**

- ☐ For Rules Interpretation, call (703) 308-1123.
- ☒ For CRF submission help, call (703) 308-4212.
- ☐ For PatentIn software help, call (703) 308-6856.

*[Signature]*  
Customer Service Center  
Initial/Patent Examination Division (703) 308-1202



SEQUENCE LISTING

(1) GENERAL INFORMATION:

- (i) APPLICANTS: Mizzen, Lee  
Wisniewski, Jan
- (ii) TITLE OF INVENTION: STREPTOCACCAL HEAT SHOCK PROTEINS OF THE  
HSP60 FAMILY
- (iii) NUMBER OF SEQUENCES: 91
- (iv) CORRESPONDENCE ADDRESS:
  - (A) ADDRESSEE: SEED and BERRY LLP
  - (B) STREET: 701 Fifth Avenue, 6300 Columbia Center
  - (C) CITY: Seattle
  - (D) STATE: Washington
  - (E) COUNTRY: USA
  - (F) ZIP: 98104
- (v) COMPUTER READABLE FORM:
  - (A) MEDIUM TYPE: Floppy disk
  - (B) COMPUTER: IBM PC compatible
  - (C) OPERATING SYSTEM: PC-DOS/MS-DOS
  - (D) SOFTWARE: PatentIn Release #1.0, Version #1.30
- (vi) CURRENT APPLICATION DATA:
  - (A) APPLICATION NUMBER: US 09/001,737
  - (B) FILING DATE: 31-DEC-1997
  - (C) CLASSIFICATION:
- (viii) ATTORNEY/AGENT INFORMATION:
  - (A) NAME: Sharkey, Richard G.
  - (B) REGISTRATION NUMBER: 32,629
  - (C) REFERENCE/DOCKET NUMBER: 870109.408
- (ix) TELECOMMUNICATION INFORMATION:
  - (A) TELEPHONE: (206) 622-4900
  - (B) TELEFAX: (206) 682-6031

(2) INFORMATION FOR SEQ ID NO:1:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 1665 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear
- (ix) FEATURE:
  - (A) NAME/KEY: CDS
  - (B) LOCATION: 15..1649
- (xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

|   |   |    |
|---|---|----|
| GAATTCGGCT TCAT   | ATG GCG GCT AAA GAC GTA AAA TTC GGT AAC GAC GCT | 50 |
|   | Met Ala Ala Lys Asp Val Lys Phe Gly Asn Asp Ala |    |
|   | 1 5 10  |    |
| CGT GTG AAA ATG CTG CGC GGC GTA AAC GTA CTG GCA GAT GCA GTG AAA | 98  |    |
| Arg Val Lys Met Leu Arg Gly Val Asn Val Leu Ala Asp Ala Val Lys |   |    |
|   | 15 20 25  |    |
| GTT ACC CTC GGC CCA AAA GGC CGT AAC GTA GTT CTG GAT AAA TCT TTC | 146   |    |
| Val Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Asp Lys Ser Phe |   |    |
|   | 30 35 40  |    |
| GGT GCA CCG ACC ATC ACT AAA GAT GGT GTT TCC GTA GCA CGT GAA ATC | 194   |    |
| Gly Ala Pro Thr Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile |   |    |
|   | 45 50 55 60                                     |    |
| GAA CTG GAA GAC AAG TTC GAA AAC ATG GGT GCG CAG ATG GTG AAA GAA | 242   |    |
| Glu Leu Glu Asp Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu |   |    |
|   | 65 70 75  |    |
| GTT GCC TCT AAA GCG AAC GAC GCT GCA GGT GAC GGT ACC ACC ACC GCA | 290   |    |
| Val Ala Ser Lys Ala Asn Asp Ala Ala Gly Asp Gly Thr Thr Thr Ala |   |    |
|   | 80 85 90  |    |
| ACC GTA CTG GCT CAG TCC ATC ATC ACT GAA GGC CTG AAA GCC GTT GCT | 338   |    |
| Thr Val Leu Ala Gln Ser Ile Ile Thr Glu Gly Leu Lys Ala Val Ala |   |    |
|   | 95 100 105                                      |    |
| GCG GGC ATG AAC CCG ATG GAT CTG AAA CGT GGT ATC GAC AAA GCT GTC | 386   |    |
| Ala Gly Met Asn Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Val |   |    |
|   | 110 115 120                                     |    |
| GCT GCT GCT GTT GAA GAA CTG AAA GCA CTG TCC GTA CCG TGC TCC GAC | 434   |    |
| Ala Ala Ala Val Glu Glu Leu Lys Ala Leu Ser Val Pro Cys Ser Asp |   |    |
|   | 125 130 135 140                                 |    |
| TCT AAA GCT ATT GCT CAG GTT GGT ACC ATC TCC GCT AAC TCC GAC GAA | 482   |    |
| Ser Lys Ala Ile Ala Gln Val Gly Thr Ile Ser Ala Asn Ser Asp Glu |   |    |
|   | 145 150 155                                     |    |
| ACC GTA GGT AAA CTG ATC GCT GAA GCG ATG GAC AAA GTC GGT AAA GAA | 530   |    |
| Thr Val Gly Lys Leu Ile Ala Glu Ala Met Asp Lys Val Gly Lys Glu |   |    |
|   | 160 165 170                                     |    |
| GGC GTG ATC ACC GTT GAA GAC GGT ACC GGT CTG CAG GAC GAA CTG GAC | 578   |    |
| Gly Val Ile Thr Val Glu Asp Gly Thr Gly Leu Gln Asp Glu Leu Asp |   |    |
|   | 175 180 185                                     |    |
| GTG GTT GAA GGT ATG CAG TTC GAC CGT GGC TAC CTG TCT CCT TAC TTC | 626   |    |
| Val Val Glu Gly Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe |   |    |
|   | 190 195 200                                     |    |
| ATC AAC AAG CCG GAA ACT GGC GCA GTA GAA TTG GAA AGC CCG TTC ATC | 674   |    |
| Ile Asn Lys Pro Glu Thr Gly Ala Val Glu Leu Glu Ser Pro Phe Ile |   |    |
|   | 205 210 215 220                                 |    |
| CTG CTG GCT GAC AAG AAA ATC TCC AAC ATC CGC GAA ATG CTG CCG GTT | 722   |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Leu | Leu | Ala | Asp | Lys | Lys | Ile | Ser | Asn | Ile | Arg | Glu | Met | Leu | Pro | Val |      |
|     |     |     |     | 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |      |
| CTG | GAA | GCT | GTA | GCG | AAA | GCA | GGC | AAA | CCG | CTG | CTG | ATC | ATC | GCT | GAA | 770  |
| Leu | Glu | Ala | Val | Ala | Lys | Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu |      |
|     |     |     | 240 |     |     |     |     | 245 |     |     |     |     | 250 |     |     |      |
| GAT | GTT | GAA | GGC | GAA | GCG | CTG | GCA | ACT | CTG | GTT | GTT | AAC | ACC | ATG | CGC | 818  |
| Asp | Val | Glu | Gly | Glu | Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Thr | Met | Arg |      |
|     |     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |     |     |     |      |
| GGT | ATC | GTA | AAA | GTC | GCT | GCG | GTT | AAA | GCA | CCT | GGC | TTC | GGC | GAT | CGT | 866  |
| Gly | Ile | Val | Lys | Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg |      |
|     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     |      |
| CGT | AAA | GCA | ATG | CTG | CAG | GAT | ATC | GCT | ACC | CTG | ACC | GGT | GGT | ACC | GTT | 914  |
| Arg | Lys | Ala | Met | Leu | Gln | Asp | Ile | Ala | Thr | Leu | Thr | Gly | Gly | Thr | Val |      |
| 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |      |
| ATC | TCT | GAA | GAG | ATC | GGT | ATG | GAG | CTG | GAA | AAA | GCA | ACT | CTG | GAA | GAT | 962  |
| Ile | Ser | Glu | Glu | Ile | Gly | Met | Glu | Leu | Glu | Lys | Ala | Thr | Leu | Glu | Asp |      |
|     |     |     |     | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |      |
| CTG | GGC | CAG | GCG | AAA | CGC | GTT | GTT | ATC | AAC | AAA | GAT | ACC | ACC | ACC | ATC | 1010 |
| Leu | Gly | Gln | Ala | Lys | Arg | Val | Val | Ile | Asn | Lys | Asp | Thr | Thr | Thr | Ile |      |
|     |     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |     |      |
| ATC | GAT | GGC | GTG | GGC | GAC | GAA | GCT | GCA | ATC | CAG | GGT | CGC | GTG | ACT | CAG | 1058 |
| Ile | Asp | Gly | Val | Gly | Asp | Glu | Ala | Ala | Ile | Gln | Gly | Arg | Val | Thr | Gln |      |
|     |     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |     |     |     |      |
| ATT | CGT | CAG | CAG | ATC | GAA | GAA | GCA | ACT | TCC | GAC | TAT | GAC | CGT | GAA | AAA | 1106 |
| Ile | Arg | Gln | Gln | Ile | Glu | Glu | Ala | Thr | Ser | Asp | Tyr | Asp | Arg | Glu | Lys |      |
|     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |     |      |
| CTG | CAG | GAG | CGC | GTA | GCG | AAA | CTG | GCA | GGC | GGC | GTT | GCG | GTT | ATC | AAA | 1154 |
| Leu | Gln | Glu | Arg | Val | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys |      |
| 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |      |
| GTT | GGT | GCT | GCG | ACT | GAA | GTT | GAA | ATG | AAA | GAG | AAG | AAA | GCC | CGC | GTT | 1202 |
| Val | Gly | Ala | Ala | Thr | Glu | Val | Glu | Met | Lys | Glu | Lys | Lys | Ala | Arg | Val |      |
|     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |      |
| GAA | GAT | GCC | CTG | CAC | GCT | ACC | CGT | GCT | GCG | GTA | GAA | GAA | GGC | GTG | GTT | 1250 |
| Glu | Asp | Ala | Leu | His | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Val | Val |      |
|     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |     |      |
| GCT | GGT | GGT | GGC | GTT | GCG | CTG | ATT | CGC | GTA | GCG | TCT | AAA | ATT | GCC | GGC | 1298 |
| Ala | Gly | Gly | Gly | Val | Ala | Leu | Ile | Arg | Val | Ala | Ser | Lys | Ile | Ala | Gly |      |
|     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |     |      |
| CTG | AAA | GGT | CAG | AAC | GAA | GAC | CAG | AAC | GTA | GGT | ATC | AAA | GTT | GCG | CTG | 1346 |
| Leu | Lys | Gly | Gln | Asn | Glu | Asp | Gln | Asn | Val | Gly | Ile | Lys | Val | Ala | Leu |      |
|     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |     |      |
| CGC | GCA | ATG | GAA | TCC | CCA | CTG | CGT | CAA | ATC | GTA | CTG | AAC | TGC | GGC | GAA | 1394 |
| Arg | Ala | Met | Glu | Ser | Pro | Leu | Arg | Gln | Ile | Val | Leu | Asn | Cys | Gly | Glu |      |
| 445 |     |     |     |     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |      |

|   |      |
|---|------|
| GAG CCG TCT GTA GTG GCT AAC ACC GTG AAA GCC GGT GAC GGT AAC TAC | 1442 |
| Glu Pro Ser Val Val Ala Asn Thr Val Lys Ala Gly Asp Gly Asn Tyr |      |
| 465 470 475   |      |
| GGT TAC AAC GCT GCA ACT GAA GAA TAC GGC AAC ATG ATC GAC ATG GGT | 1490 |
| Gly Tyr Asn Ala Ala Thr Glu Glu Tyr Gly Asn Met Ile Asp Met Gly |      |
| 480 485 490   |      |
| ATC CTG GAT CCA ACC AAA GTA ACT CGT TCT GCT CTG CAG TAC GCG GCT | 1538 |
| Ile Leu Asp Pro Thr Lys Val Thr Arg Ser Ala Leu Gln Tyr Ala Ala |      |
| 495 500 505   |      |
| TCT GTT GCG GGT CTG ATG ATC ACC ACC GAG TGC ATG GTT ACC GAC CTG | 1586 |
| Ser Val Ala Gly Leu Met Ile Thr Thr Glu Cys Met Val Thr Asp Leu |      |
| 510 515 520   |      |
| CCG AAA GGC GAT GCA CCT GAC TTA GGT GCT GCT GGT GGT ATG GGC GGC | 1634 |
| Pro Lys Gly Asp Ala Pro Asp Leu Gly Ala Ala Gly Gly Met Gly Gly |      |
| 525 530 535 540   |      |
| ATG GGC GGA ATG ATG TGATCAAGCC GAATTC                           | 1665 |
| Met Gly Gly Met Met   |      |
| 545   |      |

(2) INFORMATION FOR SEQ ID NO:2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 545 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

|   |  |
|---|--|
| Met Ala Ala Lys Asp Val Lys Phe Gly Asn Asp Ala Arg Val Lys Met |  |
| 1 5 10 15   |  |
| Leu Arg Gly Val Asn Val Leu Ala Asp Ala Val Lys Val Thr Leu Gly |  |
| 20 25 30  |  |
| Pro Lys Gly Arg Asn Val Val Leu Asp Lys Ser Phe Gly Ala Pro Thr |  |
| 35 40 45  |  |
| Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile Glu Leu Glu Asp |  |
| 50 55 60  |  |
| Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu Val Ala Ser Lys |  |
| 65 70 75 80   |  |
| Ala Asn Asp Ala Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala |  |
| 85 90 95  |  |
| Gln Ser Ile Ile Thr Glu Gly Leu Lys Ala Val Ala Ala Gly Met Asn |  |
| 100 105 110   |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Pro | Met | Asp | Leu | Lys | Arg | Gly | Ile | Asp | Lys | Ala | Val | Ala | Ala | Val |     |  |
|     |     | 115 |     |     |     |     |     | 120 |     |     |     |     |     | 125 |     |  |
| Glu | Glu | Leu | Lys | Ala | Leu | Ser | Val | Pro | Cys | Ser | Asp | Ser | Lys | Ala | Ile |  |
|     |     | 130 |     |     | 135 |     |     |     |     |     | 140 |     |     |     |     |  |
| Ala | Gln | Val | Gly | Thr | Ile | Ser | Ala | Asn | Ser | Asp | Glu | Thr | Val | Gly | Lys |  |
| 145 |     |     |     |     | 150 |     |     |     |     |     | 155 |     |     | 160 |     |  |
| Leu | Ile | Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr |  |
|     |     | 165 |     |     |     |     |     | 170 |     |     |     |     |     | 175 |     |  |
| Val | Glu | Asp | Gly | Thr | Gly | Leu | Gln | Asp | Glu | Leu | Asp | Val | Val | Glu | Gly |  |
|     |     | 180 |     |     |     |     |     | 185 |     |     | 190 |     |     |     |     |  |
| Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Ile | Asn | Lys | Pro |  |
|     |     | 195 |     |     | 200 |     |     |     |     |     | 205 |     |     |     |     |  |
| Glu | Thr | Gly | Ala | Val | Glu | Leu | Glu | Ser | Pro | Phe | Ile | Leu | Leu | Ala | Asp |  |
| 210 |     |     |     |     | 215 |     |     |     |     |     | 220 |     |     |     |     |  |
| Lys | Lys | Ile | Ser | Asn | Ile | Arg | Glu | Met | Leu | Pro | Val | Leu | Glu | Ala | Val |  |
| 225 |     |     |     |     | 230 |     |     |     |     |     | 235 |     |     | 240 |     |  |
| Ala | Lys | Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly |  |
|     |     | 245 |     |     |     |     |     | 250 |     |     |     |     |     | 255 |     |  |
| Glu | Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Thr | Met | Arg | Gly | Ile | Val | Lys |  |
|     |     | 260 |     |     |     |     |     | 265 |     |     | 270 |     |     |     |     |  |
| Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met |  |
|     |     | 275 |     |     | 280 |     |     |     |     |     | 285 |     |     |     |     |  |
| Leu | Gln | Asp | Ile | Ala | Thr | Leu | Thr | Gly | Gly | Thr | Val | Ile | Ser | Glu | Glu |  |
| 290 |     |     |     |     | 295 |     |     |     |     |     | 300 |     |     |     |     |  |
| Ile | Gly | Met | Glu | Leu | Glu | Lys | Ala | Thr | Leu | Glu | Asp | Leu | Gly | Gln | Ala |  |
| 305 |     |     |     |     | 310 |     |     |     |     |     | 315 |     |     | 320 |     |  |
| Lys | Arg | Val | Val | Ile | Asn | Lys | Asp | Thr | Thr | Thr | Ile | Ile | Asp | Gly | Val |  |
|     |     | 325 |     |     |     |     |     | 330 |     |     |     |     |     | 335 |     |  |
| Gly | Asp | Glu | Ala | Ala | Ile | Gln | Gly | Arg | Val | Thr | Gln | Ile | Arg | Gln | Gln |  |
|     |     | 340 |     |     |     |     |     | 345 |     |     | 350 |     |     |     |     |  |
| Ile | Glu | Glu | Ala | Thr | Ser | Asp | Tyr | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg |  |
|     |     | 355 |     |     | 360 |     |     |     |     |     | 365 |     |     |     |     |  |
| Val | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala |  |
| 370 |     |     |     |     | 375 |     |     |     |     |     | 380 |     |     |     |     |  |
| Thr | Glu | Val | Glu | Met | Lys | Glu | Lys | Lys | Ala | Arg | Val | Glu | Asp | Ala | Leu |  |
| 385 |     |     |     |     | 390 |     |     |     |     |     | 395 |     |     | 400 |     |  |
| His | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Val | Val | Ala | Gly | Gly | Gly |  |
|     |     | 405 |     |     |     |     |     | 410 |     |     |     |     |     | 415 |     |  |
| Val | Ala | Leu | Ile | Arg | Val | Ala | Ser | Lys | Ile | Ala | Gly | Leu | Lys | Gly | Gln |  |

|   |     |     |
|---|-----|-----|
| 420   | 425 | 430 |
| Asn Glu Asp Gln Asn Val Gly Ile Lys Val Ala Leu Arg Ala Met Glu |     |     |
| 435   | 440 | 445 |
| Ser Pro Leu Arg Gln Ile Val Leu Ash Cys Gly Glu Glu Pro Ser Val |     |     |
| 450   | 455 | 460 |
| Val Ala Asn Thr Val Lys Ala Gly Asp Gly Asn Tyr Gly Tyr Asn Ala |     |     |
| 465   | 470 | 475 |
| Ala Thr Glu Glu Tyr Gly Asn Met Ile Asp Met Gly Ile Leu Asp Pro |     |     |
| 485   | 490 | 495 |
| Thr Lys Val Thr Arg Ser Ala Leu Gln Tyr Ala Ala Ser Val Ala Gly |     |     |
| 500   | 505 | 510 |
| Leu Met Ile Thr Thr Glu Cys Met Val Thr Asp Leu Pro Lys Gly Asp |     |     |
| 515   | 520 | 525 |
| Ala Pro Asp Leu Gly Ala Ala Gly Gly Met Gly Gly Met Gly Gly Met |     |     |
| 530   | 535 | 540 |
| Met   |     |     |
| 545   |     |     |

(2) INFORMATION FOR SEQ ID NO:3:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1654 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 15..1637

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

|   |     |
|---|-----|
| GAATTCGGCT TCAT ATG GCA AAA GAA ATT AAA TTT TCA TCA GAT GCC CGT | 50  |
| Met Ala Lys Glu Ile Lys Phe Ser Ser Asp Ala Arg                 |     |
| 1 5 10  |     |
| TCA GCT ATG GTC CGT GGT GTC GAT ATC CTT GCA GAT ACT GTT AAA GTA | 98  |
| Ser Ala Met Val Arg Gly Val Asp Ile Leu Ala Asp Thr Val Lys Val |     |
| 15 20 25  |     |
| ACT TTG GGA CCA AAA GGT CGC AAT GTC GTT CTT GAA AAG TCA TTC GGT | 146 |
| Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Glu Lys Ser Phe Gly |     |
| 30 35 40  |     |
| TCA CCC TTG ATT ACC AAT GAC GGT GTG ACT ATT GCC AAA GAA ATT GAA | 194 |
| Ser Pro Leu Ile Thr Asn Asp Gly Val Thr Ile Ala Lys Glu Ile Glu |     |
| 45 50 55 60   |     |

|   |     |
|---|-----|
| TTA GAA GAC CAT TTT GAA AAT ATG GGT GCC AAA TTG GTA TCA GAA GTA | 242 |
| Leu Glu Asp His Phe Glu Asn Met Gly Ala Lys Leu Val Ser Glu Val |     |
| 65 70 75  |     |
| GCT TCA AAA ACC AAT GAT ATC GCA GGT GAT GGA ACT ACA ACT GCA ACT | 290 |
| Ala Ser Lys Thr Asn Asp Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr |     |
| 80 85 90  |     |
| GTT TTG ACC CAA GCA ATC GTC CGT GAA GGA ATC AAA AAC GTC ACA GCA | 338 |
| Val Leu Thr Gln Ala Ile Val Arg Glu Gly Ile Lys Asn Val Thr Ala |     |
| 95 100 105  |     |
| GGT GCA AAT CCA ATC GGT ATT CGT CGT GGG ATT GAA ACA GCA GTT GCC | 386 |
| Gly Ala Asn Pro Ile Gly Ile Arg Arg Gly Ile Glu Thr Ala Val Ala |     |
| 110 115 120   |     |
| GCA GCA GTT GAA GCT TTG AAA AAC AAC GTC ATC CCT GTT GCC AAT AAA | 434 |
| Ala Ala Val Glu Ala Leu Lys Asn Asn Val Ile Pro Val Ala Asn Lys |     |
| 125 130 135 140   |     |
| GAA GCT ATC GCT CAA GTT GCA GCC GTA TCT TCT CGT TCT GAA AAA GTT | 482 |
| Glu Ala Ile Ala Gln Val Ala Ala Val Ser Ser Arg Ser Glu Lys Val |     |
| 145 150 155   |     |
| GGT GAG TAC ATC TCT GAA GCA ATG GAA AAA GTT GGC AAA GAC GGT GTC | 530 |
| Gly Glu Tyr Ile Ser Glu Ala Met Glu Lys Val Gly Lys Asp Gly Val |     |
| 160 165 170   |     |
| ATC ACC ATC GAA GAG TCA CGT GGT ATG GAA ACA GAG CTT GAA GTC GTA | 578 |
| Ile Thr Ile Glu Glu Ser Arg Gly Met Glu Thr Glu Leu Glu Val Val |     |
| 175 180 185   |     |
| GAA GGA ATG CAG TTT GAC CGT GGT TAC CTT TCA CAG TAC ATG GTG ACA | 626 |
| Glu Gly Met Gln Phe Asp Arg Gly Tyr Leu Ser Gln Tyr Met Val Thr |     |
| 190 195 200   |     |
| GAT AGC GAA AAA ATG GTG GCT GAC CTT GAA AAT CCG TAC ATT TTG ATT | 674 |
| Asp Ser Glu Lys Met Val Ala Asp Leu Glu Asn Pro Tyr Ile Leu Ile |     |
| 205 210 215 220   |     |
| ACA GAC AAG AAA ATT TCC AAT ATC CAA GAA ATC TTG CCA CTT TTG GAA | 722 |
| Thr Asp Lys Lys Ile Ser Asn Ile Gln Glu Ile Leu Pro Leu Leu Glu |     |
| 225 230 235   |     |
| AGC ATT CTC CAA AGC AAT CGT CCA CTC TTG ATT ATT GCG GAT GAT GTG | 770 |
| Ser Ile Leu Gln Ser Asn Arg Pro Leu Leu Ile Ile Ala Asp Asp Val |     |
| 240 245 250   |     |
| GAT GGT GAG GCT CTT CCA ACT CTT GTT TTG AAC AAG ATT CGT GGA ACC | 818 |
| Asp Gly Glu Ala Leu Pro Thr Leu Val Leu Asn Lys Ile Arg Gly Thr |     |
| 255 260 265   |     |
| TTC AAC GTA GTA GCA GTC AAG GCA CCT GGT TTT GGT GAC CGT CGC AAA | 866 |
| Phe Asn Val Val Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys |     |
| 270 275 280   |     |
| GCC ATG CTT GAA GAT ATC GCC ATC TTA ACA GGC GGA ACA GTT ATC ACA | 914 |



|   |      |
|---|------|
| Ala Met Leu Glu Asp Ile Ala Ile Leu Thr Gly Gly Thr Val Ile Thr<br>285 290 295 300  |      |
| GAA GAC CTT GGT CTT GAG TTG AAA GAT GCG ACA ATT GAA GCT CTT GGT<br>Glu Asp Leu Gly Leu Glu Leu Lys Asp Ala Thr Ile Glu Ala Leu Gly<br>305 310 315     | 962  |
| CAA GCA GCG AGA GTG ACC GTG GAC AAA GAT AGC ACG GTT ATT GTA GAA<br>Gln Ala Ala Arg Val Thr Val Asp Lys Asp Ser Thr Val Ile Val Glu<br>320 325 330     | 1010 |
| GGT GCA GGA AAT CCT GAA GCG ATT TCT CAC CGT GTT GCG GTT ATC AAG<br>Gly Ala Gly Asn Pro Glu Ala Ile Ser His Arg Val Ala Val Ile Lys<br>335 340 345     | 1058 |
| TCT CAA ATC GAA ACT ACA ACT TCT GAA TTT GAC CGT GAA AAA TTG CAA<br>Ser Gln Ile Glu Thr Thr Thr Ser Glu Phe Asp Arg Glu Lys Leu Gln<br>350 355 360     | 1106 |
| GAA CGC TTG GCC AAA TTG TCA GGT GGT GTA GCG GTT ATT AAG GTC GGA<br>Glu Arg Leu Ala Lys Leu Ser Gly Gly Val Ala Val Ile Lys Val Gly<br>365 370 375 380 | 1154 |
| GCC GCA ACT GAA ACT GAG TTG AAA GAA ATG AAA CTC CGC ATT GAA GAT<br>Ala Ala Thr Glu Thr Glu Leu Lys Glu Met Lys Leu Arg Ile Glu Asp<br>385 390 395     | 1202 |
| GCC CTC AAC GCT ACT CGT GCA GCT GTT GAA GAA GGT ATT GTT GCA GGT<br>Ala Leu Asn Ala Thr Arg Ala Ala Val Glu Glu Gly Ile Val Ala Gly<br>400 405 410     | 1250 |
| GGT GGA ACA GCT CTT GCC AAT GTG ATT CCA GCT GTT GCT ACC TTG GAA<br>Gly Gly Thr Ala Leu Ala Asn Val Ile Pro Ala Val Ala Thr Leu Glu<br>415 420 425     | 1298 |
| TTG ACA GGA GAT GAA GCA ACA GGA CGT AAT ATT GTT CTC CGT GCT TTG<br>Leu Thr Gly Asp Glu Ala Thr Gly Arg Asn Ile Val Leu Arg Ala Leu<br>430 435 440     | 1346 |
| GAA GAA CCT GTT CGT CAA ATT GCT CAC AAT GCA GGA TTT GAA GGA TCT<br>Glu Glu Pro Val Arg Gln Ile Ala His Asn Ala Gly Phe Glu Gly Ser<br>445 450 455 460 | 1394 |
| ATC GTT ATC GAT CGT TTG AAA AAT GCT GAG CTT GGT ATA GGA TTC AAC<br>Ile Val Ile Asp Arg Leu Lys Asn Ala Glu Leu Gly Ile Gly Phe Asn<br>465 470 475     | 1442 |
| GCA GCA ACT GGC GAG TGG GTT AAC ATG ATT GAT CAA GGT ATC ATT GAT<br>Ala Ala Thr Gly Glu Trp Val Asn Met Ile Asp Gln Gly Ile Ile Asp<br>480 485 490     | 1490 |
| CCA GTT AAA GTG AGT CGT TCA GCC CTA CAA AAT GCA GCA TCT GTA GCC<br>Pro Val Lys Val Ser Arg Ser Ala Leu Gln Asn Ala Ala Ser Val Ala<br>495 500 505     | 1538 |
| AGC TTG ATT TTG ACA ACA GAA GCA GTC GTA GCC AAT AAA CCA GAA CCA<br>Ser Leu Ile Leu Thr Thr Glu Ala Val Val Ala Asn Lys Pro Glu Pro<br>510 515 520     | 1586 |

[illegible]

1654

(2) INFORMATION FOR SEO ID NO:4:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 541 amino acids

(B) TYPE: amino acid

(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEO ID NO:4:

Met Ala Lys Glu Ile Lys Phe Ser Ser Asp Ala Arg Ser Ala Met Val  
1 5 10 15

Arg Gly Val Asp Ile Leu Ala Asp Thr Val Lys Val Thr Leu Gly Pro  
20 25 30

Lys Gly Arg Asn Val Val Leu Glu Lys Ser Phe Gly Ser Pro Leu Ile  
35 40 45

Thr Asn Asp Gly Val Thr Ile Ala Lys Glu Ile Glu Leu Glu Asp His  
50 55 60

Phe Glu Asn Met Gly Ala Lys Leu Val Ser Glu Val Ala Ser Lys Thr  
65 70 75 80

Asn Asp Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Thr Gln  
85 90 95

Ala Ile Val Arg Glu Gly Ile Lys Asn Val Thr Ala Gly Ala Asn Pro  
100 105 110

Ile Gly Ile Arg Arg Gly Ile Glu Thr Ala Val Ala Ala Ala Val Glu  
115 120 125

Ala Leu Lys Asn Asn Val Ile Pro Val Ala Asn Lys Glu Ala Ile Ala  
130 135 140

Gln Val Ala Ala Val Ser Ser Arg Ser Glu Lys Val Gly Glu Tyr Ile  
145 150 155 160

Ser Glu Ala Met Glu Lys Val Gly Lys Asp Gly Val Ile Thr Ile Glu  
165 170 175

Glu Ser Arg Gly Met Glu Thr Glu Leu Glu Val Val Glu Gly Met Gln  
180 185 190

Phe Asp Arg Gly Tyr Leu Ser Gln Tyr Met Val Thr Asp Ser Glu Lys

| 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Val | Ala | Asp | Leu | Glu | Asn | Pro | Tyr | Ile | Leu | Ile | Thr | Asp | Lys | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Ile | Ser | Asn | Ile | Gln | Glu | Ile | Leu | Pro | Leu | Leu | Glu | Ser | Ile | Leu | Gln |
| 225 |     |     |     | 230 |     |     |     |     |     | 235 |     |     |     |     | 240 |
| Ser | Asn | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Asp | Asp | Val | Asp | Gly | Glu | Ala |
|     |     |     | 245 |     |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Leu | Pro | Thr | Leu | Val | Leu | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Asn | Val | Val |
|     |     | 260 |     |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Glu |
|     | 275 |     |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Ile | Ala | Ile | Leu | Thr | Gly | Gly | Thr | Val | Ile | Thr | Glu | Asp | Leu | Gly |
| 290 |     |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Leu | Glu | Leu | Lys | Asp | Ala | Thr | Ile | Glu | Ala | Leu | Gly | Gln | Ala | Ala | Arg |
| 305 |     |     |     | 310 |     |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Thr | Val | Asp | Lys | Asp | Ser | Thr | Val | Ile | Val | Glu | Gly | Ala | Gly | Asn |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Pro | Glu | Ala | Ile | Ser | His | Arg | Val | Ala | Val | Ile | Lys | Ser | Gln | Ile | Glu |
|     |     | 340 |     |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Thr | Thr | Thr | Ser | Glu | Phe | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Lys | Leu | Ser | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Thr | Glu |
| 370 |     |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Thr | Glu | Leu | Lys | Glu | Met | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | Asn | Ala |
| 385 |     |     |     | 390 |     |     |     |     |     | 395 |     |     |     |     | 400 |
| Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly | Gly | Gly | Thr | Ala |
|     |     |     | 405 |     |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Leu | Ala | Asn | Val | Ile | Pro | Ala | Val | Ala | Thr | Leu | Glu | Leu | Thr | Gly | Asp |
|     |     | 420 |     |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Glu | Ala | Thr | Gly | Arg | Asn | Ile | Val | Leu | Arg | Ala | Leu | Glu | Glu | Pro | Val |
|     | 435 |     |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Arg | Gln | Ile | Ala | His | Asn | Ala | Gly | Phe | Glu | Gly | Ser | Ile | Val | Ile | Asp |
| 450 |     |     |     |     | 455 |     |     |     |     |     | 460 |     |     |     |     |
| Arg | Leu | Lys | Asn | Ala | Glu | Leu | Gly | Ile | Gly | Phe | Asn | Ala | Ala | Thr | Gly |
| 465 |     |     |     | 470 |     |     |     |     |     | 475 |     |     |     |     | 480 |
| Glu | Trp | Val | Asn | Met | Ile | Asp | Gln | Gly | Ile | Ile | Asp | Pro | Val | Lys | Val |
|     |     |     | 485 |     |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Ser | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Val | Ala | Ser | Leu | Ile | Leu |
|     |     | 500 |     |     |     |     |     | 505 |     |     |     |     | 510 |     |     |

Thr Thr Glu Ala Val Val Ala Asn Lys Pro Glu Pro Val Ala Pro Ala  
515 520 525

Pro Ala Met Asp Pro Ser Met Met Gly Gly Met Gly Gly  
530 535 540

(2) INFORMATION FOR SEQ ID NO:5:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1662 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 15..1646

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

|   |     |
|---|-----|
| GAATTCGGCT TCAT ATG GCG GCT AAA GAT GTA AAA TTC GGT AAC GAC GCT | 50  |
| Met Ala Ala Lys Asp Val Lys Phe Gly Asn Asp Ala                 |     |
| 1 5 10  |     |
| CGT GTA AAA ATG CTC CGC GGC GTA AAC GTA CTG GCA GAC GCA GTT AAA | 98  |
| Arg Val Lys Met Leu Arg Gly Val Asn Val Leu Ala Asp Ala Val Lys |     |
| 15 20 25  |     |
| GTA ACC CTG GGC CCG AAA GGC CGT AAC GTA GTG CTG GAC AAA TCC TTC | 146 |
| Val Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Asp Lys Ser Phe |     |
| 30 35 40  |     |
| GGC GCG CCA ACC ATC ACG AAA GAT GGT GTT TCT GTA GCA CGT GAA ATC | 194 |
| Gly Ala Pro Thr Ile Thr Lys Asp Gly Val Ser Val Ala Arg Glu Ile |     |
| 45 50 55 60   |     |
| GAG CTG GAA GAC AAG TTC GAA AAC ATG GGC GCG CAG ATG GTG AAA GAA | 242 |
| Glu Leu Glu Asp Lys Phe Glu Asn Met Gly Ala Gln Met Val Lys Glu |     |
| 65 70 75  |     |
| GTG GCC TCT AAA GCG AAC GAC GCT GCA GGC GAC GGT ACC ACC ACC GCG | 290 |
| Val Ala Ser Lys Ala Asn Asp Ala Ala Gly Asp Gly Thr Thr Thr Ala |     |
| 80 85 90  |     |
| ACC GTG CTG GCT CAG GCT ATC ATC ACC GAA GGT CTG AAA GCC GTT GCT | 338 |
| Thr Val Leu Ala Gln Ala Ile Ile Thr Glu Gly Leu Lys Ala Val Ala |     |
| 95 100 105  |     |
| GCG GGC ATG AAC CCA ATG GAT CTG AAA CGT GGT ATC GAC AAA GCT GTC | 386 |
| Ala Gly Met Asn Pro Met Asp Leu Lys Arg Gly Ile Asp Lys Ala Val |     |
| 110 115 120   |     |
| GCG TCC GCT GTT GAA GAA CTG AAA GCG CTG TCC GTA CCG TGC TCT GAC | 434 |
| Ala Ser Ala Val Glu Glu Leu Lys Ala Leu Ser Val Pro Cys Ser Asp |     |

|   |      |     |  |     |  |     |  |
|---|------|-----|--|-----|--|-----|--|
| 125   |      | 130 |  | 135 |  | 140 |  |
| TCT AAA GCC ATT GCT CAG GTA GGT ACC ATC TCC GCT AAC TCC GAC GAA | 482  |     |  |     |  |     |  |
| Ser Lys Ala Ile Ala Gln Val Gly Thr Ile Ser Ala Asn Ser Asp Glu |      |     |  |     |  |     |  |
|   |      | 145 |  | 150 |  | 155 |  |
| ACC GTA GGT AAA CTG ATC GCG GAA GCG ATG GAT AAA GTC GGT AAA GAA | 530  |     |  |     |  |     |  |
| Thr Val Gly Lys Leu Ile Ala Glu Ala Met Asp Lys Val Gly Lys Glu |      |     |  |     |  |     |  |
|   |      | 160 |  | 165 |  | 170 |  |
| GGC GTG ATC ACC GTT GAA GAC GGT ACC GGT CTG GAA GAC GAA CTG GAC | 578  |     |  |     |  |     |  |
| Gly Val Ile Thr Val Glu Asp Gly Thr Gly Leu Glu Asp Glu Leu Asp |      |     |  |     |  |     |  |
|   |      | 175 |  | 180 |  | 185 |  |
| GTG GTT GAA GGT ATG CAG TTC GAC CGC GGT TAC CTG TCC CCA TAC TTC | 626  |     |  |     |  |     |  |
| Val Val Glu Gly Met Gln Phe Asp Arg Gly Tyr Leu Ser Pro Tyr Phe |      |     |  |     |  |     |  |
|   |      | 190 |  | 195 |  | 200 |  |
| ATC AAC AAG CCA GAA ACT GGC GCT GTT GAG CTG GAA AGC CCG TTC ATC | 674  |     |  |     |  |     |  |
| Ile Asn Lys Pro Glu Thr Gly Ala Val Glu Leu Glu Ser Pro Phe Ile |      |     |  |     |  |     |  |
|   |      | 205 |  | 210 |  | 215 |  |
| CTG CTG GCT GAC AAG AAA ATC TCC AAC ATC CGC GAA ATG CTG CCA GTG | 722  |     |  |     |  |     |  |
| Leu Leu Ala Asp Lys Lys Ile Ser Asn Ile Arg Glu Met Leu Pro Val |      |     |  |     |  |     |  |
|   |      | 225 |  | 230 |  | 235 |  |
| CTG GAA GCC GTT GCG AAA GCA GGC AAA CCG CTG GTT ATC ATT GCT GAA | 770  |     |  |     |  |     |  |
| Leu Glu Ala Val Ala Lys Ala Gly Lys Pro Leu Val Ile Ile Ala Glu |      |     |  |     |  |     |  |
|   |      | 240 |  | 245 |  | 250 |  |
| GAC GTT GAA GGC GAA GCG CTG GCG ACC CTG GTG GTT AAC ACC ATG CGT | 818  |     |  |     |  |     |  |
| Asp Val Glu Gly Glu Ala Leu Ala Thr Leu Val Val Asn Thr Met Arg |      |     |  |     |  |     |  |
|   |      | 255 |  | 260 |  | 265 |  |
| GGC ATC GTG AAA GTG GCT GCG GTT AAA GCA CCT GGC TTC GGC GAC CGC | 866  |     |  |     |  |     |  |
| Gly Ile Val Lys Val Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg |      |     |  |     |  |     |  |
|   |      | 270 |  | 275 |  | 280 |  |
| CGT AAA GCG ATG CTG CAG GAT ATC GCT ACC CTG ACC GGC GGT ACC GTC | 914  |     |  |     |  |     |  |
| Arg Lys Ala Met Leu Gln Asp Ile Ala Thr Leu Thr Gly Gly Thr Val |      |     |  |     |  |     |  |
|   |      | 285 |  | 290 |  | 295 |  |
| ATC TCT GAA GAG ATC GGT ATG GAG CTG GAA AAA GCG ACC CTG GAA GAC | 962  |     |  |     |  |     |  |
| Ile Ser Glu Glu Ile Gly Met Glu Leu Glu Lys Ala Thr Leu Glu Asp |      |     |  |     |  |     |  |
|   |      | 305 |  | 310 |  | 315 |  |
| CTG GGC CAG GCT AAA CGT GTT GTG ATC AAC AAA GAC ACC ACC ACC ATC | 1010 |     |  |     |  |     |  |
| Leu Gly Gln Ala Lys Arg Val Val Ile Asn Lys Asp Thr Thr Thr Ile |      |     |  |     |  |     |  |
|   |      | 320 |  | 325 |  | 330 |  |
| ATC GAT GGC GTG GGC GAC GAA GCG GCG ATT CAG GGC CGT GTT GGT CAG | 1058 |     |  |     |  |     |  |
| Ile Asp Gly Val Gly Asp Glu Ala Ala Ile Gln Gly Arg Val Gly Gln |      |     |  |     |  |     |  |
|   |      | 335 |  | 340 |  | 345 |  |
| ATC CGT AAG CAG ATC GAA GAA GCC ACT TCC GAT TAC GAC CGT GAA AAA | 1106 |     |  |     |  |     |  |
| Ile Arg Lys Gln Ile Glu Glu Ala Thr Ser Asp Tyr Asp Arg Glu Lys |      |     |  |     |  |     |  |
|   |      | 350 |  | 355 |  | 360 |  |

|   |      |
|---|------|
| CTG CAG GAG CGC GTA GCG AAA CTG GCA GGC GGT GTT GCG GTA ATC AAA | 1154 |
| Leu Gln Glu Arg Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys |      |
| 365 370 375 380   |      |
| GTC GGT GCT GCG ACT GAA GTT GAA ATG AAA GAG AAA AAA GCA CGC GTT | 1202 |
| Val Gly Ala Ala Thr Glu Val Glu Met Lys Glu Lys Lys Ala Arg Val |      |
| 385 390 395   |      |
| GAC GAT GCC CTG CAC GCG ACC CGT GCT GCG GTA GAA GAA GGC GTG GTT | 1250 |
| Asp Asp Ala Leu His Ala Thr Arg Ala Ala Val Glu Glu Gly Val Val |      |
| 400 405 410   |      |
| GCT GGT GGT GGT GTG GCG CTG GTG CGT GTT GCC GCG AAA CTG TCC GGC | 1298 |
| Ala Gly Gly Gly Val Ala Leu Val Arg Val Ala Ala Lys Leu Ser Gly |      |
| 415 420 425   |      |
| CTG ACT GCT CAG AAC GAA GAT CAG AAC GTG GGT ATC AAA GTT GCG CTG | 1346 |
| Leu Thr Ala Gln Asn Glu Asp Gln Asn Val Gly Ile Lys Val Ala Leu |      |
| 430 435 440   |      |
| CGC GCA ATG GAA GCT CCA CTG CGT CAG ATC GTG TCC AAC GCC GGT GAA | 1394 |
| Arg Ala Met Glu Ala Pro Leu Arg Gln Ile Val Ser Asn Ala Gly Glu |      |
| 445 450 455 460   |      |
| GAG CCA TCT GTT GTG ACC AAC AAC GTG AAA GCA GGC GAA GGT AAC TAC | 1442 |
| Glu Pro Ser Val Val Thr Asn Asn Val Lys Ala Gly Glu Gly Asn Tyr |      |
| 465 470 475   |      |
| GGT TAC AAC GCA GCA ACT GAA GAA TAC GGC AAC ATG ATC GAC TTC GGT | 1490 |
| Gly Tyr Asn Ala Ala Thr Glu Glu Tyr Gly Asn Met Ile Asp Phe Gly |      |
| 480 485 490   |      |
| ATC CTG GAT CCA ACC AAA GTG ACC CGT TCT GCT CTG CAG TAC GCG GCA | 1538 |
| Ile Leu Asp Pro Thr Lys Val Thr Arg Ser Ala Leu Gln Tyr Ala Ala |      |
| 495 500 505   |      |
| TCT GTC GCT GGC CTG ATG ATC ACC ACC GAG TGC ATG GTG ACC GAC CTG | 1586 |
| Ser Val Ala Gly Leu Met Ile Thr Thr Glu Cys Met Val Thr Asp Leu |      |
| 510 515 520   |      |
| CCT AAA GGC GAC GCA CCT GAC TTA GGT GCT GCA GGC ATG GGT GGG ATG | 1634 |
| Pro Lys Gly Asp Ala Pro Asp Leu Gly Ala Ala Gly Met Gly Gly Met |      |
| 525 530 535 540   |      |
| GGC GGT ATG ATG TGATCAAGCC GAATTC                               | 1662 |
| Gly Gly Met Met   |      |

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 544 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ala | Ala | Lys | Asp | Val | Lys | Phe | Gly | Asn | Asp | Ala | Arg | Val | Lys | Met |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Leu | Arg | Gly | Val | Asn | Val | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |
| Pro | Lys | Gly | Arg | Asn | Val | Val | Leu | Asp | Lys | Ser | Phe | Gly | Ala | Pro | Thr |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Ile | Thr | Lys | Asp | Gly | Val | Ser | Val | Ala | Arg | Glu | Ile | Glu | Leu | Glu | Asp |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Lys | Phe | Glu | Asn | Met | Gly | Ala | Gln | Met | Val | Lys | Glu | Val | Ala | Ser | Lys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Ala | Asn | Asp | Ala | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Gln | Ala | Ile | Ile | Thr | Glu | Gly | Leu | Lys | Ala | Val | Ala | Ala | Gly | Met | Asn |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Pro | Met | Asp | Leu | Lys | Arg | Gly | Ile | Asp | Lys | Ala | Val | Ala | Ser | Ala | Val |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Glu | Glu | Leu | Lys | Ala | Leu | Ser | Val | Pro | Cys | Ser | Asp | Ser | Lys | Ala | Ile |
|     | 130 |     |     |     |     |     | 135 |     |     |     | 140 |     |     |     |     |
| Ala | Gln | Val | Gly | Thr | Ile | Ser | Ala | Asn | Ser | Asp | Glu | Thr | Val | Gly | Lys |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Leu | Ile | Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Val | Glu | Asp | Gly | Thr | Gly | Leu | Glu | Asp | Glu | Leu | Asp | Val | Val | Glu | Gly |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Ile | Asn | Lys | Pro |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Glu | Thr | Gly | Ala | Val | Glu | Leu | Glu | Ser | Pro | Phe | Ile | Leu | Leu | Ala | Asp |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Lys | Lys | Ile | Ser | Asn | Ile | Arg | Glu | Met | Leu | Pro | Val | Leu | Glu | Ala | Val |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     | 240 |     |
| Ala | Lys | Ala | Gly | Lys | Pro | Leu | Val | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Glu | Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Thr | Met | Arg | Gly | Ile | Val | Lys |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Leu | Gln | Asp | Ile | Ala | Thr | Leu | Thr | Gly | Gly | Thr | Val | Ile | Ser | Glu | Glu |
|     | 290 |     |     |     |     |     | 295 |     |     |     | 300 |     |     |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Ile | Gly | Met | Glu | Leu | Glu | Lys | Ala | Thr | Leu | Glu | Asp | Leu | Gly | Gln | Ala |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| Lys | Arg | Val | Val | Ile | Asn | Lys | Asp | Thr | Thr | Thr | Ile | Ile | Asp | Gly | Val |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
| Gly | Asp | Glu | Ala | Ala | Ile | Gln | Gly | Arg | Val | Gly | Gln | Ile | Arg | Lys | Gln |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| Ile | Glu | Glu | Ala | Thr | Ser | Asp | Tyr | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg |  |
|     |     |     | 355 |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
| Val | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| Thr | Glu | Val | Glu | Met | Lys | Glu | Lys | Lys | Ala | Arg | Val | Asp | Asp | Ala | Leu |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
| His | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Val | Val | Ala | Gly | Gly | Gly |  |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| Val | Ala | Leu | Val | Arg | Val | Ala | Ala | Lys | Leu | Ser | Gly | Leu | Thr | Ala | Gln |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| Asn | Glu | Asp | Gln | Asn | Val | Gly | Ile | Lys | Val | Ala | Leu | Arg | Ala | Met | Glu |  |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
| Ala | Pro | Leu | Arg | Gln | Ile | Val | Ser | Asn | Ala | Gly | Glu | Glu | Pro | Ser | Val |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| Val | Thr | Asn | Asn | Val | Lys | Ala | Gly | Glu | Gly | Asn | Tyr | Gly | Tyr | Asn | Ala |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| Ala | Thr | Glu | Glu | Tyr | Gly | Asn | Met | Ile | Asp | Phe | Gly | Ile | Leu | Asp | Pro |  |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| Thr | Lys | Val | Thr | Arg | Ser | Ala | Leu | Gln | Tyr | Ala | Ala | Ser | Val | Ala | Gly |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| Leu | Met | Ile | Thr | Thr | Glu | Cys | Met | Val | Thr | Asp | Leu | Pro | Lys | Gly | Asp |  |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| Ala | Pro | Asp | Leu | Gly | Ala | Ala | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Met |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 1661 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS



(B) LOCATION: 15..1649

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

|   |     |
|---|-----|
| GAATTCGGCT TCAT ATG GCA AAA GAA ATC AAA TTT TCA GCA GAT GCG CGT | 50  |
| Met Ala Lys Glu Ile Lys Phe Ser Ala Asp Ala Arg                 |     |
| 1 5 10  |     |
| GCT GCC ATG GTG CGC GGA GTT GAT ATG TTA GCA GAT ACC GTC AAA GTA | 98  |
| Ala Ala Met Val Arg Gly Val Asp Met Leu Ala Asp Thr Val Lys Val |     |
| 15 20 25  |     |
| ACG CTT GGT CCT AAA GGG CGC AAT GTT GTT CTT GAA AAA GCT TTT GGT | 146 |
| Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Glu Lys Ala Phe Gly |     |
| 30 35 40  |     |
| TCT CCC TTA ATT ACT AAT GAC GGG GTA ACC ATT GCT AAA GAG ATC GAA | 194 |
| Ser Pro Leu Ile Thr Asn Asp Gly Val Thr Ile Ala Lys Glu Ile Glu |     |
| 45 50 55 60   |     |
| TTA GAA GAT CAT TTT GAA AAC ATG GGA GCA AAA TTG GTG TCT GAA GTG | 242 |
| Leu Glu Asp His Phe Glu Asn Met Gly Ala Lys Leu Val Ser Glu Val |     |
| 65 70 75  |     |
| GCT TCT AAA ACC AAT GAT ATT GCT GGT GAT GGG ACG ACT ACT GCA ACA | 290 |
| Ala Ser Lys Thr Asn Asp Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr |     |
| 80 85 90  |     |
| GTT TTG ACA CAA GCC ATT GTT CAT GAA GGA CTA AAA AAT GTG ACA GCA | 338 |
| Val Leu Thr Gln Ala Ile Val His Glu Gly Leu Lys Asn Val Thr Ala |     |
| 95 100 105  |     |
| GGT GCT AAT CCA ATT GGT ATC CGT CGA GGC ATT GAA ACA GCA ACA GCA | 386 |
| Gly Ala Asn Pro Ile Gly Ile Arg Arg Gly Ile Glu Thr Ala Thr Ala |     |
| 110 115 120   |     |
| ACA GCT GTT GAA GCC TTG AAA GCC ATT GCT CAA CCT GTA TCT GGC AAG | 434 |
| Thr Ala Val Glu Ala Leu Lys Ala Ile Ala Gln Pro Val Ser Gly Lys |     |
| 125 130 135 140   |     |
| GAA GCT ATT GCT CAG GTC GCT GCA GTA TCA TCA CGC TCT GAA AAA GTT | 482 |
| Glu Ala Ile Ala Gln Val Ala Ala Val Ser Ser Arg Ser Glu Lys Val |     |
| 145 150 155   |     |
| GGA GAG TAT ATC TCA GAA GCT ATG GAG CGT GTG GGC AAC GAT GGT GTG | 530 |
| Gly Glu Tyr Ile Ser Glu Ala Met Glu Arg Val Gly Asn Asp Gly Val |     |
| 160 165 170   |     |
| ATT ACC ATC GAA GAA TCT CGA GGT ATG GAA ACA GAA CTT GAA GTG GTT | 578 |
| Ile Thr Ile Glu Glu Ser Arg Gly Met Glu Thr Glu Leu Glu Val Val |     |
| 175 180 185   |     |
| GAA GGC ATG CAA TTT GAC CGT GGT TAC CTG TCT CAA TAC ATG GTC ACA | 626 |
| Glu Gly Met Gln Phe Asp Arg Gly Tyr Leu Ser Gln Tyr Met Val Thr |     |
| 190 195 200   |     |
| GAC AAT GAA AAA ATG GTT GCA GAC CTT GAA AAC CCA TTT ATC TTA ATC | 674 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Asp | Asn | Glu | Lys | Met | Val | Ala | Asp | Leu | Glu | Asn | Pro | Phe | Ile | Leu | Ile |      |
| 205 |     |     |     |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |      |
| ACG | GAT | AAA | AAA | GTG | TCA | AAC | ATC | CAA | GAC | ATT | TTG | CCA | CTA | CTT | GAG | 722  |
| Thr | Asp | Lys | Lys | Val | Ser | Asn | Ile | Gln | Asp | Ile | Leu | Pro | Leu | Leu | Glu |      |
|     |     |     |     | 225 |     |     |     |     | 230 |     |     |     |     |     | 235 |      |
| GAA | GTT | CTT | AAA | ACC | AAC | CGT | CCA | TTA | CTC | ATT | ATT | GCA | GAT | GAT | GTG | 770  |
| Glu | Val | Leu | Lys | Thr | Asn | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Asp | Asp | Val |      |
|     |     |     | 240 |     |     |     |     | 245 |     |     |     |     | 250 |     |     |      |
| GAT | GGT | GAA | GCA | CTT | CCA | ACC | CTT | GTC | TTG | AAC | AAG | ATT | CGT | GGT | ACT | 818  |
| Asp | Gly | Glu | Ala | Leu | Pro | Thr | Leu | Val | Leu | Asn | Lys | Ile | Arg | Gly | Thr |      |
|     |     | 255 |     |     |     |     | 260 |     |     |     |     | 265 |     |     |     |      |
| TTC | AAT | GTG | GTT | GCT | GTC | AAA | GCG | CCA | GGA | TTT | GGT | GAT | CGT | CGT | AAA | 866  |
| Phe | Asn | Val | Val | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys |      |
|     | 270 |     |     |     |     | 275 |     |     |     |     | 280 |     |     |     |     |      |
| GCT | ATG | CTT | GAA | GAC | ATT | GCT | ATC | TTG | ACA | GGT | GGT | ACA | GTG | ATT | ACA | 914  |
| Ala | Met | Leu | Glu | Asp | Ile | Ala | Ile | Leu | Thr | Gly | Gly | Thr | Val | Ile | Thr |      |
| 285 |     |     |     |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |      |
| GAG | GAT | CTA | GGA | CTT | GAA | TTA | AAA | GAT | GCT | ACA | ATG | ACA | GCC | CTT | GGA | 962  |
| Glu | Asp | Leu | Gly | Leu | Glu | Leu | Lys | Asp | Ala | Thr | Met | Thr | Ala | Leu | Gly |      |
|     |     |     |     | 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |      |
| CAG | GCT | GCT | AAG | ATT | ACA | GTT | GAT | AAA | GAT | AGC | ACA | GTA | ATT | GTT | GAA | 1010 |
| Gln | Ala | Ala | Lys | Ile | Thr | Val | Asp | Lys | Asp | Ser | Thr | Val | Ile | Val | Glu |      |
|     |     |     | 320 |     |     |     |     | 325 |     |     |     |     | 330 |     |     |      |
| GGT | TCA | GGA | AGT | TCA | GAA | GCT | ATT | GCT | AAC | CGT | ATT | GCA | CTG | ATT | AAA | 1058 |
| Gly | Ser | Gly | Ser | Ser | Glu | Ala | Ile | Ala | Asn | Arg | Ile | Ala | Leu | Ile | Lys |      |
|     |     | 335 |     |     |     |     | 340 |     |     |     |     | 345 |     |     |     |      |
| TCG | CAA | TTA | GAA | ACA | ACA | ACT | TCT | GAC | TTT | GAC | CGT | GAA | AAA | CTA | CAA | 1106 |
| Ser | Gln | Leu | Glu | Thr | Thr | Thr | Ser | Asp | Phe | Asp | Arg | Glu | Lys | Leu | Gln |      |
|     | 350 |     |     |     |     | 355 |     |     |     |     | 360 |     |     |     |     |      |
| GAA | CGT | TTG | GCG | AAA | TTA | GCT | GGT | GGT | GTA | GCT | GTT | ATC | AAA | GTA | GGA | 1154 |
| Glu | Arg | Leu | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly |      |
| 365 |     |     |     |     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |      |
| GCT | CCA | ACA | GAG | ACA | GCT | TTA | AAA | GAA | ATG | AAA | CTT | CGC | ATT | GAG | GAT | 1202 |
| Ala | Pro | Thr | Glu | Thr | Ala | Leu | Lys | Glu | Met | Lys | Leu | Arg | Ile | Glu | Asp |      |
|     |     |     |     | 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |      |
| GCT | CTA | AAT | GCT | ACA | CGT | GCA | GCC | GTT | GAA | GAA | GGT | ATC | GTT | GCT | GGT | 1250 |
| Ala | Leu | Asn | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly |      |
|     |     |     | 400 |     |     |     |     | 405 |     |     |     |     | 410 |     |     |      |
| GGT | GGA | ACA | GCA | CTT | ATT | ACG | GTT | ATT | GAA | AAA | GTA | GCA | GCT | CTT | GAG | 1298 |
| Gly | Gly | Thr | Ala | Leu | Ile | Thr | Val | Ile | Glu | Lys | Val | Ala | Ala | Leu | Glu |      |
|     |     | 415 |     |     |     |     | 420 |     |     |     |     | 425 |     |     |     |      |
| CTT | GAG | GGC | GAT | GAT | GCT | ACT | GGA | CGT | AAC | ATT | GTG | CTT | CGT | GCT | CTA | 1346 |
| Leu | Glu | Gly | Asp | Asp | Ala | Thr | Gly | Arg | Asn | Ile | Val | Leu | Arg | Ala | Leu |      |
|     | 430 |     |     |     |     | 435 |     |     |     |     | 440 |     |     |     |     |      |

|   |      |
|---|------|
| GAA GAG CCT GTA CGT CAA ATT GCT TTA AAT GCT GGG TAC GAA GGC TCC | 1394 |
| Glu Glu Pro Val Arg Gln Ile Ala Leu Asn Ala Gly Tyr Glu Gly Ser |      |
| 445 450 455 460   |      |
| GTA GTT ATT GAC AAG TTG AAA AAC AGC CCT GCA GGA ACA GGA TTT AAT | 1442 |
| Val Val Ile Asp Lys Leu Lys Asn Ser Pro Ala Gly Thr Gly Phe Asn |      |
| 465 470 475   |      |
| GCT GCA ACA GGT GAG TGG GTT GAT ATG ATT AAA ACA GGA ATC ATT GAC | 1490 |
| Ala Ala Thr Gly Glu Trp Val Asp Met Ile Lys Thr Gly Ile Ile Asp |      |
| 480 485 490   |      |
| CCT GTC AAA GTA ACA CGA TCA GCG CTT CAA AAT GCA GCT TCT GTA GCT | 1538 |
| Pro Val Lys Val Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Val Ala |      |
| 495 500 505   |      |
| AGT CTT ATT TTG ACA ACA GAA GCA GTT GTT GCT AAT AAA CCT GAA CCA | 1586 |
| Ser Leu Ile Leu Thr Thr Glu Ala Val Val Ala Asn Lys Pro Glu Pro |      |
| 510 515 520   |      |
| GCT ACG CCA GCG CCA GCA ATG CCA GCA GGT ATG GAT CCA GGA ATG ATG | 1634 |
| Ala Thr Pro Ala Pro Ala Met Pro Ala Gly Met Asp Pro Gly Met Met |      |
| 525 530 535 540   |      |
| GGT GGG ATG GGC GGA TAAGCCGAAT TC                               | 1661 |
| Gly Gly Met Gly Gly   |      |
| 545   |      |

(2) INFORMATION FOR SEQ ID NO:8:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 545 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

|   |  |
|---|--|
| Met Ala Lys Glu Ile Lys Phe Ser Ala Asp Ala Arg Ala Ala Met Val |  |
| 1 5 10 15   |  |
| Arg Gly Val Asp Met Leu Ala Asp Thr Val Lys Val Thr Leu Gly Pro |  |
| 20 25 30  |  |
| Lys Gly Arg Asn Val Val Leu Glu Lys Ala Phe Gly Ser Pro Leu Ile |  |
| 35 40 45  |  |
| Thr Asn Asp Gly Val Thr Ile Ala Lys Glu Ile Glu Leu Glu Asp His |  |
| 50 55 60  |  |
| Phe Glu Asn Met Gly Ala Lys Leu Val Ser Glu Val Ala Ser Lys Thr |  |
| 65 70 75 80   |  |
| Asn Asp Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Thr Gln |  |
| 85 90 95  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Ile | Val | His | Glu | Gly | Leu | Lys | Asn | Val | Thr | Ala | Gly | Ala | Asn | Pro | 100 | 105 | 110 |
| Ile | Gly | Ile | Arg | Arg | Gly | Ile | Glu | Thr | Ala | Thr | Ala | Thr | Ala | Val | Glu | 115 | 120 | 125 |
| Ala | Leu | Lys | Ala | Ile | Ala | Gln | Pro | Val | Ser | Gly | Lys | Glu | Ala | Ile | Ala | 130 | 135 | 140 |
| Gln | Val | Ala | Ala | Val | Ser | Ser | Arg | Ser | Glu | Lys | Val | Gly | Glu | Tyr | Ile | 145 | 150 | 155 |
| Ser | Glu | Ala | Met | Glu | Arg | Val | Gly | Asn | Asp | Gly | Val | Ile | Thr | Ile | Glu | 165 | 170 | 175 |
| Glu | Ser | Arg | Gly | Met | Glu | Thr | Glu | Leu | Glu | Val | Val | Glu | Gly | Met | Gln | 180 | 185 | 190 |
| Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Gln | Tyr | Met | Val | Thr | Asp | Asn | Glu | Lys | 195 | 200 | 205 |
| Met | Val | Ala | Asp | Leu | Glu | Asn | Pro | Phe | Ile | Leu | Ile | Thr | Asp | Lys | Lys | 210 | 215 | 220 |
| Val | Ser | Asn | Ile | Gln | Asp | Ile | Leu | Pro | Leu | Leu | Glu | Glu | Val | Leu | Lys | 225 | 230 | 235 |
| Thr | Asn | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Asp | Asp | Val | Asp | Gly | Glu | Ala | 245 | 250 | 255 |
| Leu | Pro | Thr | Leu | Val | Leu | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Asn | Val | Val | 260 | 265 | 270 |
| Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Glu | 275 | 280 | 285 |
| Asp | Ile | Ala | Ile | Leu | Thr | Gly | Gly | Thr | Val | Ile | Thr | Glu | Asp | Leu | Gly | 290 | 295 | 300 |
| Leu | Glu | Leu | Lys | Asp | Ala | Thr | Met | Thr | Ala | Leu | Gly | Gln | Ala | Ala | Lys | 305 | 310 | 315 |
| Ile | Thr | Val | Asp | Lys | Asp | Ser | Thr | Val | Ile | Val | Glu | Gly | Ser | Gly | Ser | 325 | 330 | 335 |
| Ser | Glu | Ala | Ile | Ala | Asn | Arg | Ile | Ala | Leu | Ile | Lys | Ser | Gln | Leu | Glu | 340 | 345 | 350 |
| Thr | Thr | Thr | Ser | Asp | Phe | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | 355 | 360 | 365 |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Pro | Thr | Glu | 370 | 375 | 380 |
| Thr | Ala | Leu | Lys | Glu | Met | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | Asn | Ala | 385 | 390 | 395 |

Thr Arg Ala Ala Val Glu Glu Gly Ile Val Ala Gly Gly Gly Thr Ala  
 405 410 415  
 Leu Ile Thr Val Ile Glu Lys Val Ala Ala Leu Glu Leu Glu Gly Asp  
 420 425 430  
 Asp Ala Thr Gly Arg Asn Ile Val Leu Arg Ala Leu Glu Glu Pro Val  
 435 440 445  
 Arg Gln Ile Ala Leu Asn Ala Gly Tyr Glu Gly Ser Val Val Ile Asp  
 450 455 460  
 Lys Leu Lys Asn Ser Pro Ala Gly Thr Gly Phe Asn Ala Ala Thr Gly  
 465 470 475 480  
 Glu Trp Val Asp Met Ile Lys Thr Gly Ile Ile Asp Pro Val Lys Val  
 485 490 495  
 Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Val Ala Ser Leu Ile Leu  
 500 505 510  
 Thr Thr Glu Ala Val Val Ala Asn Lys Pro Glu Pro Ala Thr Pro Ala  
 515 520 525  
 Pro Ala Met Pro Ala Gly Met Asp Pro Gly Met Met Gly Gly Met Gly  
 530 535 540  
 Gly  
 545

(2) INFORMATION FOR SEQ ID NO:9:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 544 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

Met Ala Lys Glu Ile Lys Phe Ser Glu Glu Ala Arg Arg Ala Met Leu  
 1 5 10 15  
 Arg Gly Val Asp Ala Leu Ala Asp Ala Val Lys Val Thr Leu Gly Pro  
 20 25 30  
 Lys Gly Arg Asn Val Val Leu Glu Lys Lys Phe Gly Ser Pro Leu Ile  
 35 40 45  
 Thr Asn Asp Gly Val Thr Ile Ala Lys Glu Ile Glu Leu Glu Asp Ala  
 50 55 60  
 Phe Glu Asn Met Gly Ala Lys Leu Val Ala Glu Val Ala Ser Lys Thr  
 65 70 75 80

|     |     |            |            |            |            |            |            |     |     |     |            |            |     |     |            |
|-----|-----|------------|------------|------------|------------|------------|------------|-----|-----|-----|------------|------------|-----|-----|------------|
| Asn | Asp | Val        | Ala        | Gly<br>85  | Asp        | Gly        | Thr        | Thr | Thr | Ala | Thr        | Val        | Leu | Ala | Gln        |
| Ala | Met | Ile        | Arg<br>100 | Glu        | Gly        | Leu        | Lys        | Asn | Val | Thr | Ala        | Gly        | Ala | Asn | Pro        |
| Val | Gly | Val        | Arg<br>115 | Lys        | Gly        | Met        | Glu        | Gln | Ala | Val | Ala        | Val        | Ala | Ile | Glu        |
| Asn | Leu | Lys        | Glu        | Ile        | Ser        | Lys<br>135 | Pro        | Ile | Glu | Gly | Lys<br>140 | Glu        | Ser | Ile | Ala        |
| Gln | Val | Ala        | Ala        | Ile        | Ser<br>150 | Ala        | Ala        | Asp | Glu | Glu | Val        | Gly        | Ser | Leu | Ile<br>160 |
| Ala | Glu | Ala        | Met        | Glu<br>165 | Arg        | Val        | Gly        | Asn | Asp | Gly | Val        | Ile        | Thr | Ile | Glu        |
| Glu | Ser | Lys        | Gly<br>180 | Phe        | Thr        | Thr        | Glu        | Leu | Glu | Val | Val        | Glu        | Gly | Met | Gln        |
| Phe | Asp | Arg<br>195 | Gly        | Tyr        | Ala        | Ser        | Pro<br>200 | Tyr | Met | Val | Thr        | Asp<br>205 | Ser | Asp | Lys        |
| Met | Glu | Ala        | Val        | Leu        | Asp        | Asn<br>215 | Pro        | Tyr | Ile | Leu | Ile<br>220 | Thr        | Asp | Lys | Lys        |
| Ile | Thr | Asn        | Ile        | Gln        | Glu<br>230 | Ile        | Leu        | Pro | Val | Leu | Glu        | Gln        | Val | Val | Gln<br>240 |
| Gln | Gly | Lys        | Pro        | Leu<br>245 | Leu        | Leu        | Ile        | Ala | Glu | Asp | Val        | Glu        | Gly | Glu | Ala        |
| Leu | Ala | Thr        | Leu<br>260 | Val        | Val        | Asn        | Lys        | Leu | Arg | Gly | Thr        | Phe        | Asn | Ala | Val        |
| Ala | Val | Lys<br>275 | Ala        | Pro        | Gly        | Phe        | Gly<br>280 | Asp | Arg | Arg | Lys        | Ala<br>285 | Met | Leu | Glu        |
| Asp | Ile | Ala        | Val        | Leu        | Thr        | Gly<br>295 | Gly        | Glu | Val | Ile | Thr        | Glu        | Asp | Leu | Gly        |
| Leu | Asp | Leu        | Lys        | Ser        | Thr<br>310 | Gln        | Ile        | Ala | Gln | Leu | Gly        | Arg        | Ala | Ser | Lys<br>320 |
| Val | Val | Val        | Thr        | Lys<br>325 | Glu        | Asn        | Thr        | Thr | Ile | Val | Glu        | Gly        | Ala | Gly | Glu<br>335 |
| Thr | Asp | Lys        | Ile<br>340 | Ser        | Ala        | Arg        | Val        | Thr | Gln | Ile | Arg        | Ala        | Gln | Val | Glu        |
| Glu | Thr | Thr<br>355 | Ser        | Glu        | Phe        | Asp        | Arg<br>360 | Glu | Lys | Leu | Gln        | Glu        | Arg | Leu | Ala        |
| Lys | Leu | Ala        | Gly        | Gly        | Val        | Ala<br>375 | Val        | Ile | Lys | Val | Gly        | Ala        | Ala | Thr | Glu<br>380 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Glu | Leu | Lys | Glu | Arg | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | Asn | Ser | 385 | 390 | 395 | 400 |
| Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ser | Gly | Gly | Gly | Thr | Ala | 405 | 410 | 415 |     |
| Leu | Val | Asn | Val | Tyr | Asn | Lys | Val | Ala | Ala | Val | Glu | Ala | Glu | Gly | Asp | 420 | 425 | 430 |     |
| Ala | Gln | Thr | Gly | Ile | Asn | Ile | Val | Leu | Arg | Ala | Leu | Glu | Glu | Pro | Ile | 435 | 440 | 445 |     |
| Arg | Gln | Ile | Ala | His | Asn | Ala | Gly | Leu | Glu | Gly | Ser | Val | Ile | Val | Glu | 450 | 455 | 460 |     |
| Arg | Leu | Lys | Asn | Glu | Glu | Ile | Gly | Val | Gly | Phe | Asn | Ala | Ala | Thr | Gly | 465 | 470 | 475 | 480 |
| Glu | Trp | Val | Asn | Met | Ile | Glu | Lys | Gly | Ile | Val | Asp | Pro | Thr | Lys | Val | 485 | 490 | 495 |     |
| Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Val | Ala | Ala | Met | Phe | Leu | 500 | 505 | 510 |     |
| Thr | Thr | Glu | Ala | Val | Val | Ala | Asp | Lys | Pro | Glu | Glu | Asn | Gly | Gly | Gly | 515 | 520 | 525 |     |
| Ala | Gly | Met | Pro | Asp | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Met | 530 | 535 | 540 |     |

(2) INFORMATION FOR SEQ ID NO:10:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 539 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Met | Ala | Lys | Thr | Leu | Leu | Phe | Gly | Glu | Glu | Ala | Arg | Arg | Ser | Met | Gln | 1  | 5  | 10 | 15 |
| Ala | Gly | Val | Asp | Lys | Leu | Ala | Asn | Thr | Val | Lys | Val | Thr | Leu | Gly | Pro | 20 | 25 | 30 |    |
| Lys | Gly | Arg | Asn | Val | Ile | Leu | Asp | Lys | Lys | Phe | Gly | Ser | Pro | Leu | Ile | 35 | 40 | 45 |    |
| Thr | Asn | Asp | Gly | Val | Thr | Ile | Ala | Arg | Glu | Ile | Glu | Leu | Glu | Asp | Ala | 50 | 55 | 60 |    |
| Tyr | Glu | Asn | Met | Gly | Ala | Gln | Leu | Val | Lys | Glu | Val | Ala | Thr | Lys | Thr |    |    |    |    |

| 65  | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Leu | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Ile | Ile | Arg | Glu | Gly | Leu | Lys | Asn | Val | Thr | Ala | Gly | Ala | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Ile | Leu | Ile | Arg | Asn | Gly | Ile | Lys | Thr | Ala | Val | Glu | Lys | Ala | Val | Glu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Glu | Ile | Gln | Lys | Ile | Ser | Lys | Pro | Val | Asn | Gly | Lys | Glu | Asp | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Arg | Val | Ala | Ala | Ile | Ser | Ala | Ala | Asp | Glu | Lys | Ile | Gly | Lys | Leu | Ile |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Ala | Asp | Ala | Met | Glu | Lys | Val | Gly | Asn | Glu | Gly | Val | Ile | Thr | Val | Glu |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Glu | Ser | Lys | Ser | Met | Gly | Thr | Glu | Leu | Asp | Val | Val | Glu | Gly | Met | Gln |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Arg | Gly | Tyr | Val | Ser | Ala | Tyr | Met | Val | Thr | Asp | Thr | Glu | Lys |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Met | Glu | Ala | Val | Leu | Asp | Asn | Pro | Leu | Val | Leu | Ile | Thr | Asp | Lys | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Ile | Ser | Asn | Ile | Gln | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Gln | Ile | Val | Gln |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ala | Gly | Lys | Lys | Leu | Leu | Ile | Ile | Ala | Asp | Asp | Ile | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Met | Thr | Thr | Leu | Val | Val | Asn | Lys | Leu | Arg | Gly | Thr | Phe | Thr | Cys | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Gly | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Glu | Met | Leu | Gln |
|     | 275 |     |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Ile | Ala | Thr | Leu | Thr | Gly | Gly | Val | Val | Ile | Ser | Asp | Glu | Val | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Gly | Asp | Leu | Lys | Glu | Ala | Thr | Leu | Asp | Met | Leu | Gly | Glu | Ala | Glu | Ser |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Lys | Val | Thr | Lys | Glu | Ser | Thr | Thr | Ile | Val | Asn | Gly | Arg | Gly | Asn |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Ser | Glu | Glu | Ile | Lys | Asn | Arg | Ile | Asn | Gln | Ile | Lys | Leu | Gln | Leu | Glu |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Ala | Thr | Thr | Ser | Glu | Phe | Asp | Lys | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala |
|     |     |     | 355 |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Val | Lys | Val | Gly | Ala | Ala | Thr | Glu |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Glu | Leu | Lys | Glu | Ser | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | Ala | Ala | 385 | 390 | 395 | 400 |
| Thr | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Thr | Ala | 405 | 410 |     | 415 |
| Tyr | Val | Asn | Val | Ile | Asn | Glu | Val | Ala | Lys | Leu | Thr | Ser | Asp | Ile | Gln | 420 | 425 |     | 430 |
| Asp | Glu | Gln | Val | Gly | Ile | Asn | Ile | Ile | Val | Arg | Ser | Leu | Glu | Glu | Pro | 435 | 440 |     | 445 |
| Met | Arg | Gln | Ile | Ala | His | Asn | Ala | Gly | Leu | Glu | Gly | Ser | Val | Ile | Ile | 450 | 455 |     | 460 |
| Glu | Lys | Val | Lys | Asn | Ser | Asp | Ala | Gly | Val | Gly | Phe | Asp | Ala | Leu | Arg | 465 | 470 |     | 475 |
| Gly | Glu | Tyr | Lys | Asp | Met | Ile | Lys | Ala | Gly | Ile | Val | Asp | Pro | Thr | Lys | 485 | 490 |     | 495 |
| Val | Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Val | Ala | Ser | Thr | Phe | 500 | 505 |     | 510 |
| Leu | Thr | Thr | Glu | Ala | Ala | Val | Ala | Asp | Ile | Pro | Glu | Lys | Glu | Met | Pro | 515 | 520 |     | 525 |
| Gln | Gly | Ala | Gly | Met | Gly | Met | Asp | Gly | Met | Tyr |     |     |     |     |     | 530 | 535 |     |     |

(2) INFORMATION FOR SEQ ID NO:11:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 551 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Met | Ala | Asn | Met | Val | Val | Thr | Gly | Glu | Gln | Leu | Asp | Lys | Ser | Ile | Arg | 1  | 5  | 10 | 15 |
| Glu | Val | Val | Arg | Ile | Leu | Glu | Asp | Ala | Val | Gly | Cys | Thr | Ala | Gly | Pro | 20 | 25 | 30 |    |
| Lys | Gly | Leu | Thr | Val | Ala | Ile | Ser | Lys | Pro | Tyr | Gly | Ala | Pro | Glu | Val | 35 | 40 | 45 |    |
| Thr | Lys | Asp | Gly | Tyr | Lys | Val | Met | Lys | Ser | Ile | Lys | Pro | Glu | Asp | Pro | 50 | 55 | 60 |    |
| Leu | Ala | Leu | Ala | Ile | Ala | Asn | Ile | Ile | Ala | Gln | Ser | Ala | Ser | Gln | Cys |    |    |    |    |

| 65  |     |     |     |     | 70  |     |     |     |     |     | 75  |     |     |     |     | 80 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Asn | Asp | Lys | Val | Gly | Asp | Gly | Thr | Thr | Thr | Cys | Ser | Ile | Leu | Thr | Ala |    |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |    |
| Lys | Val | Ile | Glu | Glu | Val | Ser | Lys | Val | Lys | Ala | Ala | Gly | Ala | Asp | Ile |    |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |    |
| Ile | Cys | Val | Arg | Glu | Gly | Val | Leu | Lys | Ala | Lys | Glu | Ala | Val | Leu | Glu |    |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |    |
| Ala | Leu | Lys | Cys | Met | Lys | Arg | Glu | Val | Leu | Ser | Glu | Glu | Glu | Ile | Ala |    |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |    |
| Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | Lys | Asn | Ile | Gly | Thr | Lys |    |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |    |
| Ile | Ala | Gln | Cys | Val | Lys | Glu | Val | Gly | Lys | Asp | Gly | Val | Ile | Thr | Val |    |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |    |
| Glu | Glu | Ser | Lys | Gly | Phe | Lys | Glu | Leu | Asp | Val | Glu | Lys | Thr | Asp | Gly |    |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     |     | 190 |     |    |
| Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Val | Thr | Asn | Ser |    |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |    |
| Glu | Lys | Met | Leu | Val | Glu | Phe | Glu | Asn | Pro | Tyr | Ile | Leu | Leu | Thr | Glu |    |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |    |
| Lys | Lys | Leu | Asn | Ile | Ile | Gln | Pro | Leu | Leu | Pro | Ile | Leu | Glu | Asn | Ile |    |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |    |
| Ala | Arg | Ser | Gly | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly |    |
|     |     |     | 245 |     |     |     |     |     | 250 |     |     |     |     | 255 |     |    |
| Glu | Ala | Leu | Ser | Thr | Leu | Val | Leu | Asn | Lys | Leu | Arg | Gly | Gly | Leu | His |    |
|     |     | 260 |     |     |     |     |     | 265 |     |     |     |     | 270 |     |     |    |
| Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Asp | Met |    |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |    |
| Leu | Gly | Asp | Ile | Ala | Ile | Leu | Thr | Gly | Ala | Lys | His | Val | Ile | Asn | Asp |    |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |    |
| Glu | Leu | Ala | Ile | Lys | Met | Glu | Asp | Leu | Thr | Leu | Cys | Asp | Leu | Gly | Thr |    |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     | 320 |     |    |
| Ala | Lys | Asn | Ile | Arg | Ile | Thr | Lys | Asp | Thr | Thr | Thr | Ile | Ile | Gly | Ser |    |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |    |
| Val | Asp | Asn | Ser | Cys | Ala | His | Val | Gln | Ser | Arg | Ile | Cys | Gln | Ile | Arg |    |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |    |
| Met | Gln | Ile | Asp | Asn | Ser | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | Gln |    |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |    |
| Glu | Arg | Leu | Ala | Lys | Leu | Ser | Gly | Gly | Val | Ala | Val | Leu | Lys | Val | Gly |    |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Ser | Ser | Glu | Val | Glu | Val | Lys | Glu | Arg | Lys | Asp | Arg | Val | Glu | Asp | 385 | 390 | 395 | 400 |
| Ala | Leu | His | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Val | Val | Pro | Gly | 405 | 410 |     | 415 |
| Gly | Gly | Ala | Ala | Leu | Leu | Tyr | Thr | Leu | Ser | Ala | Leu | Asp | Asn | Leu | Lys | 420 | 425 |     | 430 |
| Ser | Lys | Asn | Asp | Asp | Glu | Gln | Leu | Gly | Ile | Asn | Ile | Val | Lys | Arg | Ala | 435 | 440 |     | 445 |
| Leu | Gln | Ala | Pro | Ile | Lys | Arg | Ile | Ile | Lys | Asn | Ala | Gly | Ser | Glu | Asn | 450 | 455 |     | 460 |
| Ala | Pro | Cys | Val | Ile | Ala | His | Leu | Leu | Lys | Gln | Asn | Asp | Lys | Glu | Leu | 465 | 470 | 475 | 480 |
| Ile | Phe | Asn | Val | Asp | Val | Thr | Asn | Phe | Ala | Asn | Ala | Phe | Thr | Ser | Gly | 485 | 490 |     | 495 |
| Val | Ile | Asp | Pro | Leu | Lys | Val | Val | Arg | Ile | Ala | Phe | Asp | Phe | Ala | Val | 500 | 505 |     | 510 |
| Ser | Leu | Ala | Ala | Val | Phe | Met | Thr | Leu | Asn | Ala | Ile | Val | Val | Asp | Ile | 515 | 520 |     | 525 |
| Pro | Ser | Lys | Asp | Asp | Asn | Ser | Ala | Ala | Gly | Gly | Ala | Gly | Met | Gly | Gly | 530 | 535 |     | 540 |
| Met | Gly | Gly | Met | Gly | Gly | Phe |     |     |     |     |     |     |     |     |     | 545 | 550 |     |     |

(2) INFORMATION FOR SEQ ID NO:12:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 548 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Met | Ala | Ala | Lys | Asp | Val | Lys | Phe | Gly | Asn | Asp | Ala | Arg | Val | Lys | Met | 1  | 5  | 10 | 15 |
| Leu | Asn | Gly | Val | Asn | Ile | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly | 20 | 25 |    | 30 |
| Pro | Lys | Gly | Arg | Asn | Val | Val | Leu | Asp | Lys | Ser | Phe | Gly | Ala | Pro | Thr | 35 | 40 |    | 45 |
| Ile | Thr | Lys | Asp | Gly | Val | Ser | Val | Ala | Arg | Glu | Ile | Glu | Leu | Glu | Asp |    |    |    |    |

| 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Phe | Glu | Asn | Met | Gly | Ala | Gln | Met | Val | Lys | Glu | Val | Ala | Ser | Lys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Ala | Asn | Asp | Ala | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Gln | Ala | Ile | Val | Asn | Glu | Gly | Leu | Lys | Ala | Val | Ala | Ala | Gly | Met | Asn |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Pro | Met | Asp | Leu | Lys | Arg | Gly | Ile | Asp | Lys | Ala | Val | Asn | Ser | Val | Val |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Ala | Glu | Leu | Lys | Asn | Leu | Ser | Lys | Pro | Cys | Glu | Thr | Ser | Lys | Glu | Ile |
|     |     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |
| Glu | Gln | Val | Gly | Thr | Ile | Ser | Ala | Asn | Ser | Asp | Ser | Ile | Val | Gly | Gln |
| 145 |     |     |     |     |     |     | 150 |     |     |     |     | 155 |     |     | 160 |
| Leu | Ile | Ala | Gln | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Val | Glu | Asp | Gly | Thr | Gly | Leu | Glu | Asp | Glu | Leu | Asp | Val | Val | Glu | Gly |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     |     | 190 |     |
| Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Ile | Asn | Lys | Pro |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Glu | Thr | Ala | Gly | Thr | Val | Glu | Leu | Asp | Asn | Pro | Phe | Ile | Leu | Leu | Val |
|     |     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |
| Asp | Lys | Lys | Ile | Ser | Asn | Ile | Arg | Glu | Leu | Leu | Pro | Val | Leu | Glu | Ala |
| 225 |     |     |     |     |     |     | 230 |     |     |     |     | 235 |     |     | 240 |
| Val | Ala | Lys | Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Gly | Glu | Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Thr | Met | Arg | Gly | Ile | Val |
|     |     |     | 260 |     |     |     |     |     | 265 |     |     |     | 270 |     |     |
| Lys | Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Met | Leu | Gln | Asp | Ile | Ala | Ile | Leu | Thr | Ala | Gly | Thr | Val | Ile | Ser | Glu |
|     |     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |
| Glu | Ile | Gly | Met | Glu | Leu | Glu | Lys | Ala | Thr | Leu | Glu | Glu | Leu | Gly | Gln |
| 305 |     |     |     |     |     |     | 310 |     |     |     |     | 315 |     |     | 320 |
| Ala | Lys | Arg | Val | Val | Ile | Thr | Lys | Asp | Asn | Thr | Thr | Ile | Ile | Asp | Gly |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Ile | Gly | Asp | Glu | Ala | Gln | Ile | Lys | Ala | Arg | Val | Val | Gln | Ile | Arg | Gln |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Gln | Ile | Glu | Asp | Ser | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | Gln | Glu |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |

Arg Val Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala  
 370 375 380  
 Ala Thr Glu Val Ala Met Lys Glu Lys Lys Asp Arg Val Asp Asp Ala  
 385 390 395 400  
 Leu His Ala Thr Arg Ala Ala Val Glu Glu Gly Ile Val Pro Gly Gly  
 405 410 415  
 Gly Val Ala Leu Val Arg Ala Ala Asn Lys Val Ser Ala Thr Leu Thr  
 420 425 430  
 Gly Asp Asn Glu Glu Gln Asn Val Gly Ile Lys Leu Ala Leu Arg Ala  
 435 440 445  
 Met Glu Ala Pro Leu Arg Gln Ile Val Glu Asn Ser Gly Glu Asp Ala  
 450 455 460  
 Ser Val Val Ala Arg Asp Val Lys Asp Gly Ser Gly Asn Phe Gly Tyr  
 465 470 475 480  
 Asn Ala Thr Thr Glu Glu Tyr Gly Asp Met Leu Glu Met Gly Ile Leu  
 485 490 495  
 Asp Pro Thr Lys Val Thr Arg Ser Ala Leu Gln Phe Ala Ala Ser Ile  
 500 505 510  
 Ala Gly Leu Met Ile Thr Thr Glu Cys Met Ile Thr Asp Leu Pro Lys  
 515 520 525  
 Glu Asp Lys Leu Asp Ala Gln Ala Ala Met Gly Gly Met Gly Gly Met  
 530 535 540  
 Gly Gly Met Met  
 545

(2) INFORMATION FOR SEQ ID NO:13:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 549 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

Met Ala Lys Glu Leu Arg Phe Gly Asp Asp Ala Arg Leu Gln Met Leu  
 1 5 10 15  
 Ala Gly Val Asn Ala Leu Ala Asp Ala Val Gln Val Thr Met Gly Pro  
 20 25 30  
 Arg Gly Arg Asn Val Val Leu Glu Lys Ser Tyr Gly Ala Pro Thr Val

| 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Lys | Asp | Gly | Val | Ser | Val | Ala | Lys | Glu | Ile | Glu | Phe | Glu | His | Arg |
| 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |
| Phe | Met | Asn | Met | Gly | Ala | Gln | Met | Val | Lys | Glu | Val | Ala | Ser | Lys | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Ser | Asp | Thr | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Arg |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ser | Ile | Leu | Val | Glu | Gly | His | Lys | Ala | Val | Ala | Ala | Gly | Met | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Met | Asp | Leu | Lys | Arg | Gly | Ile | Asp | Lys | Ala | Val | Leu | Ala | Val | Thr | Lys |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Lys | Leu | Gln | Ala | Met | Ser | Lys | Pro | Cys | Lys | Asp | Ser | Lys | Ala | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Gln | Val | Gly | Thr | Ile | Ser | Ala | Asn | Ser | Asp | Glu | Ala | Ile | Gly | Ala | Ile |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Ile | Ala | Glu | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr | Val |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Glu | Asp | Gly | Asn | Gly | Leu | Glu | Asn | Glu | Leu | Ser | Val | Val | Glu | Gly | Met |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Gln | Phe | Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Asn | Asn | Gln | Gln |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Asn | Met | Ser | Cys | Glu | Leu | Glu | His | Pro | Phe | Ile | Leu | Leu | Val | Asp | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Lys | Val | Ser | Ser | Ile | Arg | Glu | Met | Leu | Ser | Val | Leu | Glu | Gly | Val | Ala |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Lys | Ser | Gly | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Asn | Met | Arg | Gly | Ile | Val | Lys | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Cys | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Gln | Asp | Ile | Ala | Ile | Leu | Thr | Lys | Gly | Gln | Val | Ile | Ser | Glu | Glu | Ile |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Gly | Lys | Ser | Leu | Glu | Gly | Ala | Thr | Leu | Glu | Asp | Leu | Gly | Ser | Ala | Lys |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Arg | Ile | Val | Val | Thr | Lys | Glu | Asn | Thr | Thr | Ile | Ile | Asp | Gly | Glu | Gly |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Lys | Ala | Thr | Glu | Ile | Asn | Ala | Arg | Ile | Thr | Gln | Ile | Arg | Ala | Gln | Met |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |

Glu Glu Thr Thr Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg Val  
 355 360 365  
 Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Val Gly Ala Ala Thr  
 370 375 380  
 Glu Val Glu Met Lys Glu Lys Lys Ala Arg Val Glu Asp Ala Leu His  
 385 390 395 400  
 Ala Thr Arg Ala Ala Val Glu Glu Gly Ile Val Ala Gly Gly Gly Val  
 405 410 415  
 Ala Leu Ile Arg Ala Gln Lys Ala Leu Asp Ser Leu Lys Gly Asp Asn  
 420 425 430  
 Asp Asp Gln Asn Met Gly Ile Asn Ile Leu Arg Arg Ala Ile Glu Ser  
 435 440 445  
 Pro Met Arg Gln Ile Val Thr Asn Ala Gly Tyr Glu Ala Ser Val Val  
 450 455 460  
 Val Asn Lys Val Ala Glu His Lys Asp Asn Tyr Gly Phe Asn Ala Ala  
 465 470 475 480  
 Thr Gly Glu Tyr Gly Asp Met Val Glu Met Gly Ile Leu Asp Pro Thr  
 485 490 495  
 Lys Val Thr Arg Met Ala Leu Gln Asn Ala Ala Ser Val Ala Ser Leu  
 500 505 510  
 Met Leu Thr Thr Glu Cys Met Val Ala Asp Leu Pro Lys Lys Glu Glu  
 515 520 525  
 Gly Val Gly Ala Gly Asp Met Gly Gly Met Gly Gly Met Gly Gly Met  
 530 535 540  
 Gly Gly Met Met Glx  
 545

(2) INFORMATION FOR SEQ ID NO:14:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 541 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

Met Ala Lys Thr Ile Ala Tyr Asp Glu Glu Ala Arg Arg Gly Leu Glu  
 1 5 10 15  
 Arg Gly Leu Asn Ala Leu Ala Asp Ala Val Lys Val Thr Leu Gly Pro

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gly | Arg | Asn | Val | Val | Leu | Glu | Lys | Lys | Trp | Gly | Ala | Pro | Thr | Ile |
|     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Thr | Asn | Asp | Gly | Val | Ser | Ile | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Tyr | Glu | Lys | Ile | Gly | Ala | Glu | Leu | Val | Lys | Glu | Val | Ala | Lys | Lys | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Asp | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Leu | Val | Arg | Glu | Gly | Leu | Arg | Asn | Val | Ala | Ala | Gly | Ala | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Leu | Gly | Leu | Lys | Arg | Gly | Ile | Glu | Lys | Ala | Val | Glu | Lys | Val | Thr | Glu |
|     | 115 |     |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Thr | Leu | Leu | Lys | Ser | Ala | Lys | Glu | Val | Glu | Thr | Lys | Asp | Gln | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Ala | Thr | Ala | Ala | Ile | Ser | Ala | Gly | Asp | Gln | Ser | Ile | Gly | Asp | Leu | Ile |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Asn | Glu | Gly | Val | Ile | Thr | Val | Glu |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |
| Glu | Ser | Asn | Thr | Phe | Gly | Leu | Gln | Leu | Glu | Leu | Thr | Glu | Gly | Met | Arg |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Lys | Gly | Tyr | Ile | Ser | Gly | Tyr | Phe | Val | Thr | Asp | Ala | Glu | Arg |
|     | 195 |     |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Gln | Glu | Ala | Val | Leu | Glu | Asp | Pro | Phe | Ile | Leu | Leu | Val | Ser | Ser | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Val | Ser | Thr | Val | Lys | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Lys | Val | Ile | Gln |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Leu | Ser | Thr | Leu | Val | Val | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Lys | Ser | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Gln |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Met | Ala | Ile | Leu | Thr | Gly | Gly | Gln | Val | Ile | Ser | Glu | Glu | Val | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Leu | Ser | Leu | Glu | Ser | Ala | Asp | Ile | Ser | Leu | Leu | Gly | Lys | Ala | Arg | Lys |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Val | Val | Thr | Lys | Asp | Glu | Thr | Thr | Ile | Val | Glu | Gly | Ala | Gly | Asp |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Asp | Ala | Ile | Ala | Gly | Arg | Val | Ala | Gln | Ile | Arg | Thr | Glu | Ile | Glu | 340 | 345 | 350 |
| Asn | Ser | Asp | Ser | Asp | Tyr | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | 355 | 360 | 365 |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Ala | Gly | Ala | Ala | Thr | Glu | 370 | 375 | 380 |
| Val | Glu | Leu | Lys | Glu | Arg | Lys | His | Arg | Ile | Glu | Asp | Ala | Val | Arg | Asn | 385 | 390 | 395 |
| Ala | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly | Gly | Gly | Val | Ala | 405 | 410 | 415 |
| Leu | Leu | His | Ala | Ile | Pro | Ala | Leu | Asp | Glu | Leu | Lys | Pro | Glu | Gly | Glu | 420 | 425 | 430 |
| Glu | Ala | Thr | Gly | Ala | Asn | Ile | Val | Arg | Val | Ala | Leu | Glu | Arg | Pro | Leu | 435 | 440 | 445 |
| Lys | Gln | Ile | Ala | Phe | Asn | Gly | Gly | Leu | Glu | Pro | Gly | Val | Val | Ala | Glu | 450 | 455 | 460 |
| Lys | Val | Arg | Asn | Ser | Pro | Ala | Gly | Thr | Gly | Leu | Asn | Ala | Ala | Thr | Gly | 465 | 470 | 475 |
| Glu | Tyr | Glu | Asp | Leu | Leu | Lys | Ala | Gly | Ile | Ala | Asp | Pro | Val | Lys | Val | 485 | 490 | 495 |
| Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Ile | Ala | Gly | Leu | Phe | Leu | 500 | 505 | 510 |
| Thr | Thr | Glu | Ala | Val | Val | Ala | Asp | Lys | Pro | Glu | Lys | Ala | Ala | Ala | Pro | 515 | 520 | 525 |
| Ala | Gly | Asp | Pro | Thr | Gly | Gly | Met | Gly | Gly | Met | Asp | Phe |     |     |     | 530 | 535 | 540 |

(2) INFORMATION FOR SEQ ID NO:15:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 540 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|----|----|
| Met | Ala | Lys | Thr | Ile | Ala | Tyr | Asp | Glu | Glu | Ala | Arg | Arg | Gly | Leu | Glu | 1 | 5 | 10 | 15 |
| Arg | Gly | Leu | Asn | Ala | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly | Pro |   |   |    |    |

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gly | Arg | Asn | Val | Val | Leu | Glu | Lys | Lys | Trp | Gly | Ala | Pro | Thr | Ile |
|     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |
| Thr | Asn | Asp | Gly | Val | Ser | Ile | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Tyr | Glu | Lys | Ile | Gly | Ala | Glu | Leu | Val | Lys | Glu | Val | Ala | Lys | Lys | Thr |
| 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     |     | 80  |
| Asp | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Leu | Val | Arg | Glu | Gly | Leu | Arg | Asn | Val | Ala | Ala | Gly | Ala | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Leu | Gly | Leu | Lys | Arg | Gly | Ile | Glu | Lys | Ala | Val | Glu | Lys | Val | Thr | Glu |
|     | 115 |     |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Thr | Leu | Leu | Lys | Gly | Ala | Lys | Glu | Val | Glu | Thr | Lys | Glu | Gln | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     |     | 140 |     |     |     |
| Ala | Thr | Ala | Ala | Ile | Ser | Ala | Gly | Asp | Gln | Ser | Ile | Gly | Asp | Leu | Ile |
| 145 |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     |     | 160 |
| Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Asn | Glu | Gly | Val | Ile | Thr | Val | Glu |
|     |     |     | 165 |     |     |     |     | 170 |     |     |     |     |     | 175 |     |
| Glu | Ser | Asn | Thr | Phe | Gly | Leu | Gln | Leu | Glu | Leu | Thr | Glu | Gly | Met | Arg |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Lys | Gly | Tyr | Ile | Ser | Gly | Tyr | Phe | Val | Thr | Asp | Pro | Glu | Arg |
|     | 195 |     |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Gln | Glu | Ala | Val | Leu | Glu | Asp | Pro | Tyr | Ile | Leu | Leu | Val | Ser | Ser | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     |     | 220 |     |     |     |
| Val | Ser | Thr | Val | Lys | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Lys | Val | Ile | Gly |
| 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     |     | 240 |
| Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     | 250 |     |     |     |     |     | 255 |     |
| Leu | Ser | Thr | Leu | Val | Val | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Lys | Ser | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Gln |
|     | 275 |     |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Met | Ala | Ile | Leu | Thr | Gly | Gly | Gln | Val | Ile | Ser | Glu | Glu | Val | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Leu | Thr | Leu | Glu | Asn | Ala | Asp | Leu | Ser | Leu | Leu | Gly | Lys | Ala | Arg | Lys |
| 305 |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     |     | 320 |
| Val | Val | Val | Thr | Lys | Asp | Glu | Thr | Thr | Ile | Val | Glu | Gly | Ala | Gly | Asp |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |

Thr Asp Ala Ile Ala Gly Arg Val Ala Gln Ile Arg Gln Glu Ile Glu  
 340 345 350  
 Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg Leu Ala  
 355 360 365  
 Lys Leu Ala Gly Gly Val Ala Val Ile Lys Ala Gly Ala Ala Thr Glu  
 370 375 380  
 Val Glu Leu Lys Glu Arg Lys His Arg Ile Glu Asp Ala Val Arg Asn  
 385 390 395 400  
 Ala Lys Ala Ala Val Glu Glu Gly Ile Val Ala Gly Gly Gly Val Thr  
 405 410 415  
 Leu Leu Gln Ala Ala Pro Thr Leu Asp Glu Leu Lys Leu Glu Gly Asp  
 420 425 430  
 Glu Ala Thr Gly Ala Asn Ile Val Lys Val Ala Leu Glu Ala Pro Leu  
 435 440 445  
 Lys Gln Ile Ala Phe Asn Ser Gly Leu Glu Pro Gly Val Val Ala Glu  
 450 455 460  
 Lys Val Arg Asn Leu Pro Ala Gly His Gly Leu Asn Ala Gln Thr Gly  
 465 470 475 480  
 Val Tyr Glu Asp Leu Leu Ala Ala Gly Val Ala Asp Pro Val Lys Val  
 485 490 495  
 Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Ile Ala Gly Leu Phe Leu  
 500 505 510  
 Thr Thr Glu Ala Val Val Ala Asp Lys Pro Glu Lys Glu Lys Ala Ser  
 515 520 525  
 Val Pro Gly Gly Gly Asp Met Gly Gly Met Asp Phe  
 530 535 540

(2) INFORMATION FOR SEQ ID NO:16:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 537 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

Met Ser Lys Leu Ile Glu Tyr Asp Glu Thr Ala Arg His Ala Met Glu  
 1 5 10 15  
 Val Gly Met Asn Lys Leu Ala Asp Thr Val Arg Val Thr Leu Gly Pro

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Gly | Arg | His | Val | Val | Leu | Ala | Lys | Ala | Phe | Gly | Gly | Pro | Thr | Ile |
|     | 35  |     |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Thr | Asn | Asp | Gly | Val | Thr | Val | Ala | Arg | Glu | Ile | Asp | Leu | Glu | Asp | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Phe | Glu | Asn | Leu | Gly | Ala | Gln | Leu | Val | Lys | Ser | Val | Ala | Thr | Lys | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Asn | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Leu | Val | Lys | Gly | Gly | Leu | Arg | Met | Val | Ala | Ala | Gly | Ala | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Val | Ala | Leu | Gly | Ala | Gly | Ile | Ser | Lys | Ala | Ala | Asp | Ala | Val | Ser | Glu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Ala | Leu | Leu | Ala | Val | Ala | Thr | Pro | Val | Ala | Gly | Lys | Asp | Ala | Ile | Thr |
|     | 130 |     |     |     |     | 135 |     |     |     |     |     | 140 |     |     |     |
| Gln | Val | Ala | Thr | Val | Ser | Ser | Arg | Asp | Glu | Gln | Ile | Gly | Ala | Leu | Val |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Gly | Glu | Gly | Met | Asn | Lys | Val | Gly | Thr | Asp | Gly | Val | Val | Ser | Val | Glu |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Glu | Ser | Ser | Thr | Leu | Asp | Thr | Glu | Leu | Glu | Phe | Thr | Glu | Gly | Val | Gly |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Lys | Gly | Phe | Leu | Ser | Ala | Tyr | Phe | Val | Thr | Asp | Phe | Asp | Ser |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Gln | Gln | Ala | Val | Leu | Asp | Asp | Pro | Leu | Val | Leu | Leu | His | Gln | Glu | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Ile | Ser | Ser | Leu | Pro | Glu | Leu | Leu | Pro | Met | Leu | Glu | Lys | Val | Thr | Glu |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ser | Gly | Lys | Pro | Leu | Leu | Ile | Val | Ala | Glu | Asp | Leu | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Leu | Ala | Thr | Leu | Val | Val | Asn | Ser | Ile | Arg | Lys | Thr | Leu | Lys | Ala | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Ser | Pro | Phe | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Phe | Leu | Glu |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Leu | Ala | Ile | Val | Thr | Gly | Gly | Gln | Val | Val | Asn | Pro | Glu | Thr | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Leu | Val | Leu | Arg | Glu | Val | Gly | Thr | Asp | Val | Leu | Gly | Ser | Ala | Arg | Arg |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Val | Val | Ser | Lys | Asp | Asp | Thr | Ile | Ile | Val | Asp | Gly | Gly | Gly | Ser |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Asn | Asp | Ala | Val | Ala | Lys | Arg | Val | Asn | Gln | Leu | Arg | Ala | Glu | Ile | Glu |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| Val | Ser | Asp | Ser | Glu | Trp | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Val | Ala |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Val | Thr | Glu |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| Thr | Ala | Leu | Lys | Lys | Arg | Lys | Glu | Ser | Val | Glu | Asp | Ala | Val | Ala | Ala |  |
| 385 |     |     |     |     | 390 |     |     |     | 395 |     |     |     |     |     | 400 |  |
| Ala | Lys | Ala | Ser | Ile | Glu | Glu | Gly | Ile | Ile | Ala | Gly | Gly | Gly | Ser | Ala |  |
|     |     |     | 405 |     |     |     |     | 410 |     |     |     |     |     | 415 |     |  |
| Leu | Val | Gln | Cys | Gly | Ala | Ala | Leu | Lys | Gln | Leu | Arg | Thr | Ser | Leu | Thr |  |
|     |     | 420 |     |     |     |     | 425 |     |     |     |     |     | 430 |     |     |  |
| Gly | Asp | Glu | Ala | Leu | Gly | Ile | Asp | Val | Phe | Phe | Glu | Ala | Leu | Lys | Ala |  |
|     | 435 |     |     |     |     | 440 |     |     |     |     |     | 445 |     |     |     |  |
| Pro | Leu | Tyr | Trp | Ile | Ala | Thr | Asn | Ala | Gly | Leu | Asp | Gly | Ala | Val | Val |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| Val | Asp | Lys | Val | Ser | Gly | Leu | Pro | Ala | Gly | His | Gly | Leu | Asn | Ala | Ser |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| Thr | Leu | Gly | Tyr | Gly | Asp | Leu | Val | Ala | Asp | Gly | Val | Val | Asp | Pro | Val |  |
|     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |  |
| Lys | Val | Thr | Arg | Ser | Ala | Val | Leu | Asn | Ala | Ala | Ser | Val | Ala | Arg | Met |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| Met | Leu | Thr | Thr | Glu | Thr | Ala | Val | Val | Asp | Lys | Pro | Ala | Lys | Thr | Glu |  |
|     | 515 |     |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| Glu | His | Asp | His | His | Gly | His | Ala | His |     |     |     |     |     |     |     |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     |     |     |     |     |     |  |

(2) INFORMATION FOR SEQ ID NO:17:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 541 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Ala | Lys | Thr | Ile | Ala | Tyr | Asp | Glu | Glu | Ala | Arg | Arg | Gly | Leu | Glu |  |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     | 15  |     |     |  |
| Arg | Gly | Leu | Asn | Ser | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly | Pro |  |

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gly | Arg | Asn | Val | Val | Leu | Glu | Lys | Lys | Trp | Gly | Ala | Pro | Thr | Ile |
|     | 35  |     |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Thr | Asn | Asp | Gly | Val | Ser | Ile | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Tyr | Glu | Lys | Ile | Gly | Ala | Glu | Leu | Val | Lys | Glu | Val | Ala | Lys | Lys | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Asp | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Leu | Val | Lys | Glu | Gly | Leu | Arg | Asn | Val | Ala | Ala | Gly | Ala | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Leu | Gly | Leu | Lys | Arg | Gly | Ile | Glu | Lys | Ala | Val | Asp | Lys | Val | Thr | Glu |
|     | 115 |     |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Thr | Leu | Leu | Lys | Asp | Ala | Lys | Glu | Val | Glu | Thr | Lys | Glu | Gln | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Ala | Thr | Ala | Ala | Ile | Ser | Ala | Gly | Asp | Gln | Ser | Ile | Gly | Asp | Leu | Ile |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Met | Glu | Gly | Val | Ile | Thr | Val | Glu |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Glu | Ser | Asn | Thr | Phe | Gly | Leu | Gln | Leu | Glu | Leu | Thr | Glu | Gly | Met | Arg |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Lys | Gly | Tyr | Ile | Ser | Gly | Tyr | Phe | Val | Thr | Asp | Ala | Glu | Arg |
|     | 195 |     |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Gln | Glu | Ala | Val | Leu | Glu | Glu | Pro | Tyr | Ile | Leu | Leu | Val | Ser | Ser | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Val | Ser | Thr | Val | Lys | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Lys | Val | Ile | Gln |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ala | Gly | Lys | Ser | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Leu | Ser | Thr | Leu | Val | Val | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Lys | Ser | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Gln |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Met | Ala | Ile | Leu | Thr | Gly | Ala | Gln | Val | Ile | Ser | Glu | Glu | Val | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Leu | Thr | Leu | Glu | Asn | Thr | Asp | Leu | Ser | Leu | Leu | Gly | Lys | Ala | Arg | Lys |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Val | Met | Thr | Lys | Asp | Glu | Thr | Thr | Ile | Val | Glu | Gly | Ala | Gly | Asp |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Asp | Ala | Ile | Ala | Gly | Arg | Val | Ala | Gln | Ile | Arg | Thr | Glu | Ile | Glu | 340 | 345 | 350 |     |
| Asn | Ser | Asp | Ser | Asp | Tyr | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | 355 | 360 | 365 |     |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Ala | Gly | Ala | Ala | Thr | Glu | 370 | 375 | 380 |     |
| Val | Glu | Leu | Lys | Glu | Arg | Lys | His | Arg | Ile | Glu | Asp | Ala | Val | Arg | Asn | 385 | 390 | 395 | 400 |
| Ala | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly | Gly | Gly | Val | Thr | 405 | 410 | 415 |     |
| Leu | Leu | Gln | Ala | Ala | Pro | Ala | Leu | Asp | Lys | Leu | Lys | Leu | Thr | Gly | Asp | 420 | 425 | 430 |     |
| Glu | Ala | Thr | Gly | Ala | Asn | Ile | Val | Lys | Val | Ala | Leu | Glu | Ala | Pro | Leu | 435 | 440 | 445 |     |
| Lys | Gln | Ile | Ala | Phe | Asn | Ser | Gly | Met | Glu | Pro | Gly | Val | Val | Ala | Glu | 450 | 455 | 460 |     |
| Lys | Val | Arg | Asn | Leu | Ser | Val | Gly | His | Gly | Leu | Asn | Ala | Ala | Thr | Gly | 465 | 470 | 475 | 480 |
| Glu | Tyr | Glu | Asp | Leu | Leu | Lys | Ala | Gly | Val | Ala | Asp | Pro | Val | Lys | Val | 485 | 490 | 495 |     |
| Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Ile | Ala | Gly | Leu | Phe | Leu | 500 | 505 | 510 |     |
| Thr | Thr | Glu | Ala | Val | Val | Ala | Asp | Lys | Pro | Glu | Lys | Thr | Ala | Ala | Pro | 515 | 520 | 525 |     |
| Ala | Ser | Asp | Pro | Thr | Gly | Gly | Met | Gly | Gly | Met | Asp | Phe | 530 | 535 | 540 |     |     |     |     |

(2) INFORMATION FOR SEQ ID NO:18:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 539 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|----|----|
| Met | Ser | Lys | Leu | Ile | Glu | Tyr | Asp | Glu | Thr | Ala | Arg | Arg | Ala | Met | Glu | 1 | 5 | 10 | 15 |
| Val | Gly | Met | Asp | Lys | Leu | Ala | Asp | Thr | Val | Arg | Val | Thr | Leu | Gly | Pro |   |   |    |    |

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Gly | Arg | His | Val | Val | Leu | Ala | Lys | Ala | Phe | Gly | Gly | Pro | Thr | Val |
|     | 35  |     |     |     |     | 40  |     |     |     |     |     | 45  |     |     |     |
| Thr | Asn | Asp | Gly | Val | Thr | Val | Ala | Arg | Glu | Ile | Glu | Leu | Glu | Asp | Pro |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Phe | Glu | Asp | Leu | Gly | Ala | Gln | Leu | Val | Lys | Ser | Val | Ala | Thr | Lys | Thr |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Asn | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Ile | Leu | Ala | Gln |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Ala | Leu | Ile | Lys | Gly | Gly | Leu | Arg | Leu | Val | Ala | Ala | Gly | Val | Asn | Pro |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Ile | Ala | Leu | Gly | Val | Gly | Ile | Gly | Lys | Ala | Ala | Asp | Ala | Val | Ser | Glu |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Ala | Leu | Leu | Ala | Ser | Ala | Thr | Pro | Val | Ser | Gly | Lys | Thr | Gly | Ile | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Gln | Val | Ala | Thr | Val | Ser | Ser | Arg | Asp | Glu | Gln | Ile | Gly | Asp | Leu | Val |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Gly | Glu | Ala | Met | Ser | Lys | Val | Gly | His | Asp | Gly | Val | Val | Ser | Val | Glu |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Glu | Ser | Ser | Thr | Leu | Gly | Thr | Glu | Leu | Glu | Phe | Thr | Glu | Gly | Ile | Gly |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Phe | Asp | Lys | Gly | Phe | Leu | Ser | Ala | Tyr | Phe | Val | Thr | Asp | Phe | Asp | Asn |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Gln | Gln | Ala | Val | Leu | Glu | Asp | Ala | Leu | Ile | Leu | Leu | His | Gln | Asp | Lys |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Ile | Ser | Ser | Leu | Pro | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Lys | Val | Ala | Gly |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Thr | Gly | Lys | Pro | Leu | Leu | Ile | Val | Ala | Glu | Asp | Val | Glu | Gly | Glu | Ala |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Leu | Ala | Thr | Leu | Val | Val | Asn | Ala | Ile | Arg | Lys | Thr | Leu | Lys | Ala | Val |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Ala | Val | Lys | Gly | Pro | Tyr | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Phe | Leu | Glu |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Asp | Leu | Ala | Val | Val | Thr | Gly | Gly | Gln | Val | Val | Asn | Pro | Asp | Ala | Gly |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Met | Val | Leu | Arg | Glu | Val | Gly | Leu | Glu | Val | Leu | Gly | Ser | Ala | Arg | Arg |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Val | Val | Val | Ser | Lys | Asp | Asp | Thr | Val | Ile | Val | Asp | Gly | Gly | Gly | Thr |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Glu | Ala | Val | Ala | Asn | Arg | Ala | Lys | His | Leu | Arg | Ala | Glu | Ile | Asp | 340 | 345 | 350 |
| Lys | Ser | Asp | Ser | Asp | Trp | Asp | Arg | Glu | Lys | Leu | Gly | Glu | Arg | Leu | Ala | 355 | 360 | 365 |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Thr | Glu | 370 | 375 | 380 |
| Thr | Ala | Leu | Lys | Glu | Arg | Lys | Glu | Ser | Val | Glu | Asp | Ala | Val | Ala | Ala | 385 | 390 | 395 |
| Ala | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Ala | Ser | 405 | 410 | 415 |
| Leu | Ile | His | Gln | Ala | Arg | Lys | Ala | Leu | Thr | Glu | Leu | Arg | Ala | Ser | Leu | 420 | 425 | 430 |
| Thr | Gly | Asp | Glu | Val | Leu | Gly | Val | Asp | Val | Phe | Ser | Glu | Ala | Leu | Ala | 435 | 440 | 445 |
| Ala | Pro | Leu | Phe | Trp | Ile | Ala | Ala | Asn | Ala | Gly | Leu | Asp | Gly | Ser | Val | 450 | 455 | 460 |
| Val | Val | Lys | Lys | Val | Ser | Glu | Leu | Pro | Ala | Gly | His | Gly | Leu | Asn | Val | 465 | 470 | 475 |
| Asn | Thr | Leu | Ser | Tyr | Gly | Asp | Leu | Ala | Ala | Asp | Gly | Val | Ile | Asp | Pro | 485 | 490 | 495 |
| Val | Lys | Val | Thr | Arg | Ser | Ala | Val | Leu | Asn | Ala | Ser | Ser | Val | Ala | Arg | 500 | 505 | 510 |
| Met | Val | Leu | Thr | Thr | Glu | Thr | Val | Val | Val | Asp | Lys | Pro | Ala | Lys | Ala | 515 | 520 | 525 |
| Glu | Asp | His | Asp | His | His | His | Gly | His | Ala | His |     |     |     |     |     | 530 | 535 |     |

(2) INFORMATION FOR SEQ ID NO:19:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 545 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |   |   |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---|---|----|----|
| Met | Ala | Ala | Lys | Asp | Val | Gln | Phe | Gly | Asn | Glu | Val | Arg | Gln | Lys | Met | 1 | 5 | 10 | 15 |
| Val | Asn | Gly | Val | Asn | Ile | Leu | Ala | Asn | Ala | Val | Arg | Val | Thr | Leu | Gly |   |   |    |    |

| 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Lys | Gly | Arg | Asn | Val | Val | Val | Asp | Arg | Ala | Phe | Gly | Gly | Pro | His |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Ile | Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Glu | Ile | Glu | Leu | Lys | Asp |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Lys | Phe | Glu | Asn | Met | Gly | Ala | Gln | Met | Val | Lys | Glu | Val | Ala | Ser | Lys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Thr | Asn | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Gln | Ser | Ile | Val | Ala | Glu | Gly | Met | Lys | Tyr | Val | Thr | Ala | Gly | Met | Asn |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Pro | Thr | Asp | Leu | Lys | Arg | Gly | Ile | Asp | Lys | Ala | Val | Ala | Ala | Leu | Val |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Glu | Glu | Leu | Lys | Asn | Ile | Ala | Lys | Pro | Cys | Asp | Thr | Ser | Lys | Glu | Ile |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Ala | Gln | Val | Gly | Ser | Ile | Ser | Ala | Asn | Ser | Asp | Glu | Gln | Val | Gly | Ala |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Ile | Ile | Ala | Glu | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Val | Glu | Asp | Gly | Lys | Ser | Leu | Glu | Asn | Glu | Leu | Asp | Val | Val | Glu | Gly |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Ile | Asn | Asp | Ala |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Glu | Lys | Gln | Ile | Ala | Gly | Leu | Asp | Asn | Pro | Phe | Val | Leu | Leu | Phe | Asp |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Lys | Lys | Ile | Ser | Asn | Ile | Arg | Asp | Leu | Leu | Pro | Val | Leu | Glu | Gln | Val |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Ala | Lys | Ala | Ser | Arg | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Glu | Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Asn | Ile | Arg | Gly | Ile | Leu | Lys |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Thr | Val | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Leu | Gln | Asp | Ile | Ala | Ile | Leu | Thr | Gly | Gly | Thr | Val | Ile | Ser | Glu | Glu |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Val | Gly | Leu | Ser | Leu | Glu | Lys | Ala | Thr | Leu | Asp | Asp | Leu | Gly | Gln | Ala |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Lys | Arg | Ile | Glu | Ile | Gly | Lys | Glu | Asn | Thr | Thr | Ile | Ile | Asp | Gly | Phe |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gly | Asp | Ala | Ala | Gln | Ile | Glu | Ala | Arg | Val | Ala | Glu | Ile | Arg | Gln | Gln | 340 | 345 | 350 |
| Ile | Glu | Thr | Ala | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | Gln | Glu | Arg | 355 | 360 | 365 |
| Val | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | 370 | 375 | 380 |
| Thr | Glu | Val | Glu | Met | Lys | Glu | Lys | Lys | Asp | Arg | Val | Glu | Asp | Ala | Leu | 385 | 390 | 395 |
| His | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Val | Val | Ala | Gly | Gly | Gly | 405 | 410 | 415 |
| Val | Ala | Leu | Leu | Arg | Ala | Arg | Ala | Ala | Leu | Glu | Asn | Leu | His | Thr | Gly | 420 | 425 | 430 |
| Asn | Ala | Asp | Gln | Asp | Ala | Gly | Val | Gln | Ile | Val | Leu | Arg | Ala | Val | Glu | 435 | 440 | 445 |
| Ser | Pro | Leu | Arg | Gln | Ile | Val | Ala | Asn | Ala | Gly | Gly | Glu | Pro | Ser | Val | 450 | 455 | 460 |
| Val | Val | Asn | Lys | Val | Leu | Glu | Gly | Lys | Gly | Asn | Tyr | Gly | Tyr | Asn | Ala | 465 | 470 | 475 |
| Gly | Ser | Gly | Glu | Tyr | Gly | Asp | Met | Ile | Glu | Met | Gly | Val | Leu | Asp | Pro | 485 | 490 | 495 |
| Ala | Lys | Val | Thr | Arg | Ser | Ala | Leu | Gln | His | Ala | Ala | Ser | Ile | Ala | Gly | 500 | 505 | 510 |
| Leu | Met | Leu | Thr | Thr | Asp | Cys | Met | Ile | Ala | Glu | Ile | Pro | Glu | Glu | Lys | 515 | 520 | 525 |
| Pro | Ala | Met | Pro | Asp | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Met | 530 | 535 | 540 |
| Glx |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 545 |     |     |

(2) INFORMATION FOR SEQ ID NO:20:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 539 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

Met Val Lys Gln Leu Lys Phe Ser Glu Asp Ala Arg Gln Ala Met Leu

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|--|
| 1   |     | 5   |     | 10  |     | 15  |     |     |     |     |     |     |     |     |     |  |  |  |  |
| Arg | Gly | Val | Asp | Gln | Leu | Ala | Asn | Ala | Val | Lys | Val | Thr | Ile | Gly | Pro |  |  |  |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |  |  |  |
| Lys | Gly | Arg | Asn | Val | Val | Leu | Asp | Lys | Glu | Phe | Thr | Ala | Pro | Leu | Ile |  |  |  |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |  |  |  |
| Thr | Asn | Asp | Gly | Val | Thr | Ile | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Pro |  |  |  |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |  |  |  |
| Tyr | Glu | Asn | Met | Gly | Ala | Lys | Leu | Val | Gln | Glu | Val | Ala | Asn | Lys | Thr |  |  |  |  |
| 65  |     |     |     |     | 70  |     |     |     | 75  |     |     |     |     |     | 80  |  |  |  |  |
| Asn | Glu | Ile | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |  |  |  |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |  |  |  |
| Ala | Met | Ile | Gln | Glu | Gly | Leu | Lys | Asn | Val | Thr | Ser | Gly | Ala | Asn | Pro |  |  |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |  |  |  |
| Val | Gly | Leu | Arg | Gln | Gly | Ile | Asp | Lys | Ala | Val | Lys | Val | Ala | Val | Glu |  |  |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |  |  |
| Ala | Leu | His | Glu | Asn | Ser | Gln | Lys | Val | Glu | Asn | Lys | Asn | Glu | Ile | Ala |  |  |  |  |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |  |  |
| Gln | Val | Gly | Ala | Ile | Ser | Ala | Ala | Asp | Glu | Glu | Ile | Gly | Arg | Tyr | Ile |  |  |  |  |
| 145 |     |     |     |     | 150 |     |     |     | 155 |     |     |     |     |     | 160 |  |  |  |  |
| Ser | Glu | Ala | Thr | Glu | Lys | Val | Gly | Asn | Asp | Gly | Val | Ile | Thr | Ile | Ile |  |  |  |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |  |  |
| Thr | Ile | Glu | Glu | Ser | Asn | Arg | Leu | Asn | Thr | Glu | Leu | Glu | Leu | Gly | Met |  |  |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |  |  |
| Gln | Phe | Asp | Arg | Gly | Tyr | Gln | Ser | Pro | Tyr | Met | Val | Thr | Asp | Ser | Asp |  |  |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |  |  |
| Lys | Met | Val | Ala | Glu | Leu | Glu | Arg | Pro | Tyr | Ile | Leu | Val | Thr | Asp | Lys |  |  |  |  |
|     |     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |  |  |
| Lys | Ile | Ser | Ser | Phe | Gln | Asp | Ile | Leu | Pro | Leu | Leu | Glu | Gln | Val | Val |  |  |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |  |  |
| Gln | Ser | Asn | Arg | Pro | Ile | Leu | Ile | Val | Ala | Asp | Glu | Val | Glu | Gly | Asp |  |  |  |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |  |  |  |
| Ala | Leu | Thr | Asn | Ile | Val | Leu | Asn | Arg | Met | Arg | Gly | Thr | Phe | Thr | Ala |  |  |  |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |  |  |  |
| Val | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu |  |  |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |  |  |
| Glu | Asp | Leu | Ala | Ile | Leu | Thr | Gly | Ala | Gln | Val | Ile | Thr | Asp | Asp | Leu |  |  |  |  |
|     |     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |  |  |
| Gly | Leu | Asp | Leu | Lys | Asp | Ala | Ser | Ile | Asp | Met | Leu | Gly | Thr | Ala | Ser |  |  |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Val | Glu | Val | Thr | Lys | Asp | Asn | Thr | Thr | Val | Val | Asp | Gly | Asp | Gly | 325 | 330 | 335 |     |
| Asp | Glu | Asn | Ser | Ile | Asp | Ala | Arg | Val | Ser | Gln | Leu | Lys | Ser | Gln | Ile | 340 | 345 | 350 |     |
| Glu | Glu | Thr | Glu | Ser | Asp | Phe | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | 355 | 360 | 365 |     |
| Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Ser | 370 | 375 | 380 |     |
| Glu | Thr | Glu | Leu | Lys | Glu | Arg | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | Asn | 385 | 390 | 395 | 400 |
| Ser | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly | Gly | Gly | Thr | 405 | 410 | 415 |     |
| Ala | Leu | Val | Asn | Val | Tyr | Gln | Lys | Val | Ser | Glu | Asn | Glu | Ala | Glu | Gly | 420 | 425 | 430 |     |
| Asp | Ile | Glu | Thr | Gly | Val | Asn | Ile | Val | Leu | Lys | Ala | Leu | Thr | Ala | Pro | 435 | 440 | 445 |     |
| Val | Arg | Gln | Ile | Ala | Glu | Asn | Ala | Gly | Leu | Glu | Gly | Ser | Val | Ile | Val | 450 | 455 | 460 |     |
| Glu | Arg | Leu | Lys | Asn | Ala | Glu | Pro | Gly | Val | Gly | Phe | Asn | Gly | Ala | Thr | 465 | 470 | 475 | 480 |
| Asn | Glu | Trp | Val | Asn | Met | Leu | Arg | Arg | Gly | Ile | Val | Asp | Pro | Thr | Lys | 485 | 490 | 495 |     |
| Val | Thr | Arg | Ser | Ala | Leu | Gln | His | Ala | Ala | Ser | Val | Ala | Ala | Met | Phe | 500 | 505 | 510 |     |
| Leu | Thr | Thr | Glu | Ala | Val | Val | Ala | Ser | Ile | Pro | Glu | Lys | Asn | Asn | Asp | 515 | 520 | 525 |     |
| Gln | Pro | Asn | Met | Gly | Gly | Met | Pro | Gly | Met | Met |     |     |     |     |     | 530 | 535 |     |     |

(2) INFORMATION FOR SEQ ID NO:21:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 541 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

Met Ala Lys Ser Ile Ile Tyr Asn Asp Glu Ala Arg Arg Ala Leu Glu

| 1   | 5   | 10  | 15  |
|---|-----|-----|-----|
| Arg Gly Met Asp Ile Leu Ala Glu Ala Val Ala Val Thr Leu Gly Pro | 20  | 25  | 30  |
| Lys Gly Arg Asn Val Val Leu Glu Lys Lys Phe Gly Ser Pro Gln Ile | 35  | 40  | 45  |
| Ile Asn Asp Gly Ile Thr Ile Ala Lys Glu Ile Glu Leu Glu Asp His | 50  | 55  | 60  |
| Val Glu Asn Thr Gly Val Ser Leu Ile Arg Gln Ala Ala Ser Lys Thr | 65  | 70  | 75  |
| Asn Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala His | 85  | 90  | 95  |
| Ala Ile Val Lys Glu Gly Leu Arg Asn Val Ala Ala Gly Ala Asn Pro | 100 | 105 | 110 |
| Ile Ser Leu Lys Arg Gly Ile Asp Lys Ala Thr Asp Phe Leu Val Ala | 115 | 120 | 125 |
| Arg Ile Lys Glu His Ala Gln Pro Val Gly Asp Ser Lys Ala Ile Ala | 130 | 135 | 140 |
| Gln Val Gly Ala Ile Ser Ala Gly Asn Asp Glu Glu Val Gly Gln Met | 145 | 150 | 155 |
| Ile Ala Asn Ala Met Asp Lys Val Gly Gln Glu Gly Val Ile Ser Leu | 165 | 170 | 175 |
| Glu Glu Gly Lys Ser Met Thr Thr Glu Leu Glu Ile Thr Glu Gly Met | 180 | 185 | 190 |
| Arg Phe Asp Lys Gly Tyr Ile Ser Pro Tyr Phe Val Thr Asp Ala Glu | 195 | 200 | 205 |
| Arg Met Glu Ala Val Leu Glu Asp Pro Arg Ile Leu Ile Thr Asp Lys | 210 | 215 | 220 |
| Lys Ile Asn Leu Val Gln Asp Leu Val Pro Ile Leu Glu Gln Val Ala | 225 | 230 | 235 |
| Arg Gln Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Ile Glu Lys Glu | 245 | 250 | 255 |
| Ala Leu Ala Thr Leu Val Val Asn Arg Leu Arg Gly Val Leu Asn Val | 260 | 265 | 270 |
| Ala Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Gln Met Leu | 275 | 280 | 285 |
| Glu Asp Ile Ala Thr Leu Thr Gly Gly Gln Val Ile Ser Glu Asp Ala | 290 | 295 | 300 |
| Gly Leu Lys Leu Glu Ser Ala Thr Val Asp Ser Leu Gly Ser Ala Arg | 305 | 310 | 315 |
|   |     |     | 320 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Arg | Ile | Asn | Ile | Thr | Lys | Asp | Asn | Thr | Thr | Ile | Val | Ala | Glu | Gly | Asn |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     |     | 335 |  |
| Glu | Ala | Ala | Val | Lys | Ser | Arg | Cys | Glu | Gln | Ile | Arg | Arg | Gln | Ile | Glu |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| Glu | Thr | Asp | Ser | Ser | Tyr | Asp | Lys | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Thr | Glu |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| Thr | Glu | Met | Lys | Asp | Arg | Lys | Leu | Arg | Leu | Glu | Asp | Ala | Ile | Asn | Ala |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
| Thr | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Thr | Thr |  |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |
| Leu | Ala | His | Leu | Ala | Pro | Gln | Leu | Glu | Asp | Trp | Ala | Thr | Gly | Asn | Leu |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| Lys | Asp | Glu | Glu | Leu | Thr | Gly | Ala | Leu | Ile | Val | Ala | Arg | Ala | Leu | Pro |  |
|     | 435 |     |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
| Ala | Pro | Leu | Lys | Arg | Ile | Ala | Glu | Asn | Ala | Gly | Gln | Asn | Gly | Ala | Val |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| Ile | Ser | Glu | Arg | Val | Lys | Glu | Lys | Glu | Phe | Asn | Val | Gly | Tyr | Asn | Ala |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| Ala | Ser | Leu | Glu | Tyr | Val | Asp | Met | Leu | Ala | Ala | Gly | Ile | Val | Asp | Pro |  |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |
| Ala | Lys | Val | Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Ile | Ala | Gly |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| Met | Val | Leu | Thr | Thr | Glu | Cys | Ile | Val | Val | Asp | Lys | Pro | Glu | Lys | Glu |  |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| Lys | Ala | Pro | Ala | Gly | Ala | Pro | Gly | Gly | Asp | Phe | Asp | Tyr |     |     |     |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |

(2) INFORMATION FOR SEQ ID NO:22:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 552 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

Met Ser Lys Leu Ile Ser Phe Lys Asp Glu Ser Arg Arg Ser Leu Glu

| 1   | 5   | 10  | 15  |
|---|-----|-----|-----|
| Ala Gly Ile Asn Ala Leu Ala Asp Ala Val Arg Ile Thr Leu Gly Pro | 20  | 25  | 30  |
| Lys Gly Arg Asn Val Leu Leu Glu Lys Gln Tyr Gly Ala Pro Gln Ile | 35  | 40  | 45  |
| Val Asn Asp Gly Ile Thr Val Ala Lys Glu Ile Glu Leu Ser Asn Pro | 50  | 55  | 60  |
| Glu Glu Asn Ala Gly Ala Lys Leu Ile Gln Glu Val Ala Ser Lys Thr | 65  | 70  | 75  |
| Lys Glu Ile Ala Gly Asp Gly Thr Thr Thr Ala Thr Ile Ile Ala Gln | 85  | 90  | 95  |
| Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala Gly Ala Asn Pro | 100 | 105 | 110 |
| Val Ala Leu Arg Arg Gly Ile Glu Lys Val Thr Thr Phe Leu Val Gln | 115 | 120 | 125 |
| Glu Ile Glu Ala Val Ala Lys Pro Val Glu Gly Ser Ala Ile Ala Gln | 130 | 135 | 140 |
| Val Ala Thr Val Ser Ser Gly Asn Asp Pro Glu Val Gly Ala Met Ile | 145 | 150 | 155 |
| Ala Asp Ala Met Asp Lys Val Thr Lys Asp Gly Val Ile Thr Val Glu | 165 | 170 | 175 |
| Glu Ser Lys Ser Leu Asn Thr Glu Leu Glu Val Val Glu Gly Met Gln | 180 | 185 | 190 |
| Ile Asp Arg Gly Tyr Ile Ser Pro Tyr Phe Ile Thr Asp Ser Asp Arg | 195 | 200 | 205 |
| Gln Leu Val Glu Phe Asp Asn Pro Leu Ile Leu Ile Thr Asp Lys Lys | 210 | 215 | 220 |
| Ile Ser Ala Ile Ala Glu Leu Val Pro Val Leu Glu Ala Val Ala Arg | 225 | 230 | 235 |
| Ala Gly Arg Pro Leu Leu Ile Ile Ala Glu Asp Ile Glu Gly Glu Ala | 245 | 250 | 255 |
| Leu Ala Thr Leu Val Val Asn Lys Ala Arg Gly Val Leu Asn Val Ala | 260 | 265 | 270 |
| Ala Ile Lys Ala Pro Ala Phe Gly Asp Arg Arg Lys Ala Val Leu Gln | 275 | 280 | 285 |
| Asp Ile Ala Ile Leu Thr Gly Gly Ser Val Ile Ser Glu Asp Ile Gly | 290 | 295 | 300 |
| Leu Ser Leu Asp Thr Val Ser Leu Asp Gln Leu Gly Gln Ala Val Lys | 305 | 310 | 315 |
|   |     |     | 320 |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ala | Thr | Leu | Glu | Lys | Asp | Asn | Thr | Ile | Leu | Val | Ala | Gly | Ala | Asp | Lys | 325 | 330 | 335 |     |
| Arg | Ala | Ser | Ala | Gly | Val | Lys | Glu | Arg | Ile | Glu | Gln | Leu | Arg | Lys | Glu | 340 | 345 | 350 |     |
| Tyr | Ala | Ala | Ser | Asp | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Ile | Gln | Glu | Arg | 355 | 360 | 365 |     |
| Ile | Ala | Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | 370 | 375 | 380 |     |
| Thr | Glu | Thr | Glu | Leu | Lys | Asp | Arg | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Leu | 385 | 390 | 395 | 400 |
| Asn | Ala | Thr | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | 405 | 410 | 415 |     |
| Thr | Thr | Leu | Ile | Arg | Leu | Ala | Gly | Lys | Ile | Glu | Ser | Phe | Lys | Ala | Gln | 420 | 425 | 430 |     |
| Leu | Ser | Asn | Asp | Glu | Glu | Arg | Val | Ala | Ala | Asp | Ile | Ile | Ala | Lys | Ala | 435 | 440 | 445 |     |
| Leu | Glu | Ala | Pro | Leu | His | Gln | Leu | Ala | Ser | Asn | Ala | Gly | Val | Glu | Gly | 450 | 455 | 460 |     |
| Ser | Val | Ile | Val | Glu | Lys | Val | Lys | Glu | Ala | Thr | Gly | Asn | Gln | Gly | Tyr | 465 | 470 | 475 | 480 |
| Asn | Val | Ile | Thr | Gly | Lys | Ile | Glu | Asp | Leu | Ile | Ala | Ala | Gly | Ile | Ile | 485 | 490 | 495 |     |
| Asp | Pro | Ala | Lys | Val | Val | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Ile | 500 | 505 | 510 |     |
| Ala | Gly | Met | Val | Leu | Thr | Thr | Glu | Ala | Leu | Val | Val | Glu | Lys | Pro | Glu | 515 | 520 | 525 |     |
| Pro | Ala | Ala | Pro | Ala | Met | Pro | Asp | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | 530 | 535 | 540 |     |
| Gly | Met | Gly | Gly | Met | Gly | Met | Met |     |     |     |     |     |     |     |     | 545 | 550 |     |     |

(2) INFORMATION FOR SEQ ID NO:23:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 539 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Ala | Lys | Thr | Ile | Ala | Phe | Asp | Lys | Lys | Ala | Arg | Arg | Gly | Leu | Glu |  |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
| Arg | Gly | Leu | Asn | Ala | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly | Pro |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| Lys | Gly | Arg | Asn | Val | Val | Leu | Glu | Lys | Lys | Trp | Gly | Ala | Pro | Thr | Ile |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| Thr | Asn | Asp | Gly | Val | Ser | Ile | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Pro |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |
| Tyr | Glu | Lys | Ile | Gly | Ala | Glu | Leu | Val | Lys | Glu | Val | Ala | Lys | Lys | Thr |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
| Asp | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     |     | 95  |  |
| Ala | Leu | Val | Arg | Glu | Gly | Leu | Arg | Asn | Val | Ala | Ala | Gly | Ala | Asn | Pro |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
| Leu | Gly | Leu | Lys | Arg | Gly | Ile | Glu | Lys | Ala | Val | Glu | Ala | Val | Thr | Glu |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| His | Leu | Leu | Lys | Ala | Ala | Lys | Glu | Val | Glu | Thr | Lys | Asp | Gln | Ile | Ala |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
| Ala | Thr | Ala | Gly | Ile | Ser | Ala | Gly | Asp | Pro | Ala | Ile | Gly | Glu | Leu | Ile |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |
| Ala | Glu | Ala | Met | Asp | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr | Val | Glu |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
| Glu | Ser | Asn | Thr | Phe | Gly | Leu | Gln | Leu | Glu | Leu | Thr | Glu | Gly | Met | Arg |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     |     | 190 |     |  |
| Phe | Asp | Lys | Gly | Phe | Ile | Ser | Gly | Tyr | Phe | Ala | Thr | Asp | Ala | Glu | Arg |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| Gln | Glu | Ala | Val | Leu | Glu | Asp | Pro | Tyr | Val | Leu | Leu | Val | Ser | Gly | Lys |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
| Ile | Ser | Thr | Val | Lys | Asp | Leu | Leu | Pro | Leu | Leu | Glu | Lys | Val | Ile | Gln |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
| Ser | Gly | Lys | Pro | Leu | Ala | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu | Ala |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| Leu | Val | Thr | Leu | Ile | Val | Asn | Lys | Ile | Arg | Gly | Thr | Phe | Lys | Ser | Val |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
| Ala | Ile | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu | Gln |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
| Asp | Met | Ala | Ile | Leu | Thr | Gly | Gly | Gln | Val | Ile | Ser | Glu | Glu | Ile | Gly |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Leu | Ser | Leu | Asp | Thr | Ala | Gly | Leu | Glu | Val | Leu | Gly | Gln | Ala | Arg | Gln | 305 | 310 | 315 | 320 |
| Val | Val | Val | Thr | Lys | Asp | Glu | Thr | Thr | Ile | Val | Asp | Gly | Ala | Gly | Ser | 325 | 330 | 335 |     |
| Lys | Glu | Gln | Ile | Ala | Gly | Arg | Val | Ser | Gln | Ile | Arg | Ala | Glu | Ile | Glu | 340 | 345 | 350 |     |
| Asn | Ser | Asp | Ser | Asp | Tyr | Asp | Arg | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | 355 | 360 | 365 |     |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Ala | Gly | Ala | Ala | Thr | Glu | 370 | 375 | 380 |     |
| Asp | Leu | Lys | Glu | Arg | Lys | His | Arg | Ile | Glu | Asp | Ala | Val | Arg | Asn | Ala | 385 | 390 | 395 | 400 |
| Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Ala | Gly | Gly | Gly | Ser | Ser | Leu | 405 | 410 | 415 |     |
| Ala | Gln | Ser | Gly | Thr | Val | Phe | Asp | Ser | Xaa | Ala | Leu | Glu | Gly | Asp | Glu | 420 | 425 | 430 |     |
| Ala | Thr | Gly | Ala | Asn | Ile | Val | Lys | Val | Ala | Leu | Asp | Ala | Pro | Val | Lys | 435 | 440 | 445 |     |
| Gln | Ile | Ala | Val | Asn | Ala | Gly | Leu | Glu | Pro | Gly | Val | Val | Ala | Glu | Lys | 450 | 455 | 460 |     |
| Val | Arg | Asn | Ser | Pro | Ala | Gly | Thr | Gly | Leu | Asn | Ala | Ala | Thr | Gly | Val | 465 | 470 | 475 | 480 |
| Tyr | Glu | Asp | Leu | Leu | Ala | Ala | Gly | Ile | Asn | Asp | Pro | Val | Lys | Val | Thr | 485 | 490 | 495 |     |
| Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Ile | Ala | Ala | Leu | Phe | Leu | Thr | 500 | 505 | 510 |     |
| Thr | Glu | Ala | Val | Val | Ala | Asp | Lys | Pro | Glu | Lys | Ala | Gly | Ala | Pro | Val | 515 | 520 | 525 |     |
| Asp | Pro | Thr | Gly | Gly | Met | Gly | Gly | Met | Asp | Phe | 530 | 535 |     |     |     |     |     |     |     |

(2) INFORMATION FOR SEQ ID NO:24:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 582 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Val | Ser | Phe | Leu | Ser | Ser | Ser | Val | Ser | Arg | Leu | Pro | Leu | Arg | Ile |  |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
| Ala | Gly | Arg | Arg | Ile | Pro | Gly | Arg | Phe | Ala | Val | Pro | Gln | Val | Arg | Thr |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| Tyr | Ala | Lys | Asp | Leu | Lys | Phe | Gly | Val | Asp | Ala | Arg | Ala | Ser | Leu | Leu |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| Thr | Gly | Val | Asp | Thr | Leu | Ala | Arg | Ala | Val | Ser | Val | Thr | Leu | Gly | Pro |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |
| Lys | Gly | Arg | Asn | Val | Leu | Ile | Asp | Gln | Pro | Phe | Gly | Ser | Pro | Lys | Ile |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
| Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Arg | Ser | Val | Ser | Leu | Lys | Asp | Lys |  |
|     |     |     | 85  |     |     |     |     |     | 90  |     |     |     |     | 95  |     |  |
| Phe | Glu | Asn | Leu | Gly | Ala | Arg | Leu | Val | Gln | Asp | Val | Ala | Ser | Lys | Thr |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
| Asn | Glu | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Thr | Arg |  |
|     |     |     | 115 |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| Ala | Ile | Phe | Ser | Glu | Thr | Val | Arg | Asn | Val | Ala | Ala | Gly | Cys | Asn | Pro |  |
|     | 130 |     |     |     |     |     | 135 |     |     |     | 140 |     |     |     |     |  |
| Met | Asp | Leu | Arg | Arg | Gly | Ile | Gln | Leu | Ala | Val | Asp | Asn | Val | Val | Glu |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |
| Phe | Leu | Gln | Ala | Asn | Lys | Arg | Asp | Ile | Thr | Thr | Ser | Glu | Glu | Ile | Ser |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
| Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | Thr | His | Ile | Gly | Glu | Leu |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| Leu | Ala | Lys | Ala | Met | Glu | Arg | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr | Val |  |
|     | 195 |     |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| Lys | Glu | Gly | Arg | Thr | Ile | Ser | Asp | Glu | Leu | Glu | Val | Thr | Glu | Gly | Met |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |
| Lys | Phe | Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Thr | Asp | Val | Lys |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |
| Ser | Gln | Lys | Val | Glu | Phe | Glu | Asn | Pro | Leu | Ile | Leu | Leu | Ser | Glu | Lys |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| Lys | Val | Ser | Ala | Val | Gln | Asp | Ile | Leu | Pro | Ser | Leu | Glu | Leu | Ala | Ala |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
| Gln | Gln | Arg | Arg | Pro | Leu | Val | Ile | Ile | Ala | Glu | Asp | Val | Asp | Gly | Glu |  |
|     |     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |  |
| Ala | Leu | Ala | Ala | Cys | Ile | Leu | Asn | Lys | Leu | Arg | Gly | Gln | Leu | Gln | Val |  |
|     | 290 |     |     |     |     |     | 295 |     |     |     |     |     | 300 |     |     |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Val | Ala | Ile | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Asn | Arg | Arg | Asn | Met | Leu | 305 | 310 | 315 | 320 |
| Gly | Asp | Leu | Ala | Val | Leu | Thr | Asp | Ser | Ala | Val | Phe | Asn | Asp | Glu | Ile | 325 | 330 | 335 |     |
| Asp | Val | Ser | Ile | Glu | Lys | Ala | Gln | Pro | His | His | Leu | Gly | Ser | Cys | Gly | 340 | 345 | 350 |     |
| Ser | Val | Thr | Val | Thr | Lys | Glu | Asp | Thr | Ile | Ile | Met | Lys | Gly | Ala | Gly | 355 | 360 | 365 |     |
| Asp | His | Val | Lys | Val | Asn | Asp | Arg | Cys | Glu | Gln | Ile | Arg | Gly | Val | Met | 370 | 375 | 380 |     |
| Ala | Asp | Pro | Asn | Leu | Thr | Glu | Ser | Glu | Lys | Glu | Lys | Leu | Gln | Glu | Arg | 385 | 390 | 395 | 400 |
| Leu | Ala | Lys | Leu | Ser | Gly | Gly | Ile | Ala | Val | Ile | Lys | Val | Gly | Ala | Ser | 405 | 410 | 415 |     |
| Ser | Glu | Val | Glu | Val | Asn | Glu | Lys | Lys | Asp | Arg | Ile | Val | Asp | Ala | Leu | 420 | 425 | 430 |     |
| Asn | Ala | Val | Lys | Ala | Ala | Val | Ser | Glu | Gly | Val | Leu | Pro | Gly | Ala | Gly | 435 | 440 | 445 |     |
| Thr | Ser | Phe | Val | Lys | Ala | Ser | Leu | Arg | Leu | Gly | Asp | Ile | Pro | Thr | Asn | 450 | 455 | 460 |     |
| Asn | Phe | Asp | Gln | Lys | Leu | Gly | Val | Glu | Ile | Val | Arg | Lys | Ala | Ile | Thr | 465 | 470 | 475 | 480 |
| Arg | Pro | Ala | Gln | Thr | Ile | Leu | Glu | Asn | Ala | Gly | Leu | Glu | Gly | Asn | Leu | 485 | 490 | 495 |     |
| Ile | Val | Gly | Lys | Leu | Lys | Glu | Leu | Tyr | Gly | Lys | Glu | Phe | Asn | Ile | Gly | 500 | 505 | 510 |     |
| Tyr | Asp | Ile | Ala | Lys | Asp | Arg | Phe | Val | Asp | Leu | Asn | Glu | Ile | Gly | Val | 515 | 520 | 525 |     |
| Leu | Asp | Pro | Leu | Lys | Val | Val | Arg | Thr | Gly | Leu | Val | Asp | Ala | Ser | Gly | 530 | 535 | 540 |     |
| Val | Ala | Ser | Leu | Met | Gly | Thr | Thr | Glu | Cys | Ala | Ile | Val | Asp | Ala | Pro | 545 | 550 | 555 | 560 |
| Glu | Glu | Ser | Lys | Ala | Pro | Ala | Gly | Pro | Pro | Gly | Met | Gly | Gly | Met | Gly | 565 | 570 | 575 |     |
| Gly | Met | Pro | Gly | Met | Met |     |     |     |     |     |     |     |     |     |     | 580 |     |     |     |

(2) INFORMATION FOR SEQ ID NO:25:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 572 amino acids  
 (B) TYPE: amino acid  
 (C) STRANDEDNESS:  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Arg | Ser | Ser | Val | Val | Arg | Ser | Arg | Ala | Thr | Leu | Arg | Pro | Leu | 1   | 5   | 10  | 15  |
| Leu | Arg | Arg | Ala | Tyr | Ser | Ser | His | Lys | Glu | Leu | Lys | Phe | Gly | Val | Glu | 20  | 25  | 30  |     |
| Gly | Arg | Ala | Ser | Leu | Leu | Lys | Gly | Val | Glu | Thr | Leu | Ala | Glu | Ala | Val | 35  | 40  | 45  |     |
| Ala | Ala | Thr | Leu | Gly | Pro | Lys | Gly | Arg | Asn | Val | Leu | Ile | Glu | Gln | Pro | 50  | 55  | 60  |     |
| Phe | Gly | Pro | Pro | Lys | Ile | Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | 65  | 70  | 75  | 80  |
| Ile | Val | Leu | Lys | Asp | Lys | Phe | Glu | Asn | Met | Gly | Ala | Lys | Leu | Leu | Gln | 85  | 90  | 95  |     |
| Glu | Val | Ala | Ser | Lys | Thr | Asn | Glu | Ala | Ala | Gly | Asp | Gly | Thr | Thr | Ser | 100 | 105 | 110 |     |
| Ala | Thr | Val | Leu | Gly | Arg | Ala | Ile | Phe | Thr | Glu | Ser | Val | Lys | Asn | Val | 115 | 120 | 125 |     |
| Ala | Ala | Gly | Cys | Asn | Pro | Met | Asp | Leu | Arg | Arg | Gly | Ser | Gln | Val | Ala | 130 | 135 | 140 |     |
| Val | Glu | Lys | Val | Ile | Glu | Phe | Leu | Ser | Ala | Asn | Lys | Lys | Glu | Ile | Thr | 145 | 150 | 155 | 160 |
| Thr | Ser | Glu | Glu | Ile | Ala | Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | 165 | 170 | 175 |     |
| Ser | His | Val | Gly | Lys | Leu | Leu | Ala | Ser | Ala | Met | Glu | Lys | Val | Gly | Lys | 180 | 185 | 190 |     |
| Glu | Gly | Val | Ile | Thr | Ile | Arg | Glu | Gly | Arg | Thr | Leu | Glu | Asp | Glu | Leu | 195 | 200 | 205 |     |
| Glu | Val | Thr | Glu | Gly | Met | Arg | Phe | Asp | Arg | Gly | Phe | Ile | Ser | Pro | Tyr | 210 | 215 | 220 |     |
| Phe | Ile | Thr | Asp | Pro | Lys | Ser | Ser | Lys | Val | Glu | Phe | Glu | Lys | Pro | Leu | 225 | 230 | 235 | 240 |
| Leu | Leu | Leu | Ser | Glu | Lys | Lys | Ile | Ser | Ser | Ile | Gln | Asp | Ile | Leu | Pro | 245 | 250 | 255 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Ala | Leu | Glu | Ile | Ser | Asn | Gln | Ser | Arg | Arg | Pro | Leu | Leu | Ile | Ile | Ala |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |
| Glu | Asp | Val | Asp | Gly | Glu | Ala | Leu | Ala | Ala | Cys | Ile | Leu | Asn | Lys | Leu |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |
| Arg | Gly | Gln | Val | Lys | Val | Cys | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |
| Asn | Arg | Lys | Asn | Thr | Ile | Gly | Asp | Ile | Ala | Val | Leu | Thr | Gly | Gly | Thr |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |
| Val | Phe | Thr | Glu | Glu | Leu | Asp | Leu | Lys | Pro | Glu | Gln | Cys | Thr | Ile | Glu |  |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |  |
| Asn | Leu | Gly | Ser | Cys | Asp | Ser | Ile | Thr | Val | Thr | Lys | Glu | Asp | Thr | Val |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |
| Ile | Leu | Asn | Gly | Ser | Gly | Pro | Lys | Glu | Ala | Ile | Gln | Glu | Arg | Ile | Glu |  |
|     | 355 |     |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |
| Gln | Ile | Lys | Gly | Ser | Ile | Asp | Ile | Thr | Thr | Thr | Asn | Ser | Tyr | Glu | Lys |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |
| Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | Lys | Leu | Ser | Gly | Gly | Val | Ala | Val |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |
| Ile | Arg | Val | Gly | Gly | Ala | Ser | Glu | Val | Glu | Val | Gly | Glu | Lys | Lys | Asp |  |
|     |     |     | 405 |     |     |     |     | 410 |     |     |     |     |     | 415 |     |  |
| Arg | Tyr | Asp | Asp | Ala | Leu | Asn | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |
| Ile | Leu | Pro | Gly | Gly | Gly | Thr | Ala | Leu | Val | Lys | Ala | Ser | Arg | Val | Leu |  |
|     | 435 |     |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |
| Asp | Glu | Val | Val | Val | Asp | Asn | Phe | Asp | Gln | Lys | Leu | Gly | Val | Asp | Ile |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |
| Ile | Arg | Lys | Ala | Ile | Thr | Arg | Pro | Ala | Lys | Gln | Ile | Ile | Glu | Asn | Ala |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |
| Gly | Glu | Glu | Gly | Ser | Val | Ile | Ile | Gly | Lys | Leu | Ile | Asp | Glu | Tyr | Gly |  |
|     |     |     | 485 |     |     |     |     | 490 |     |     |     |     |     | 495 |     |  |
| Asp | Asp | Phe | Ala | Lys | Gly | Tyr | Asp | Ala | Ser | Lys | Ser | Glu | Tyr | Thr | Asp |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |
| Met | Leu | Ala | Thr | Gly | Ile | Ile | Asp | Pro | Phe | Lys | Val | Val | Arg | Ser | Gly |  |
|     | 515 |     |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |
| Leu | Val | Asp | Ala | Ser | Gly | Val | Ala | Ser | Leu | Leu | Ala | Thr | Thr | Glu | Val |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |
| Ala | Ile | Val | Asp | Ala | Pro | Glu | Pro | Pro | Ala | Ala | Ala | Gly | Ala | Gly | Gly |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |

Met Pro Gly Gly Met Pro Gly Met Pro Gly Met Met  
565 570

(2) INFORMATION FOR SEQ ID NO:26:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 577 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ile | Ser | Thr | Leu | Arg | Gly | Lys | Ile | Phe | Asn | Asn | Gly | Ser | Asn | Arg | 1   | 5   | 10  | 15  |
| Asn | Lys | Cys | Val | Ser | Ile | Leu | Ser | Asn | Ile | Gln | Lys | Arg | Asn | Ile | Ser | 20  | 25  | 30  |     |
| Lys | Asp | Ile | Arg | Phe | Gly | Ser | Asp | Ala | Arg | Thr | Ala | Met | Leu | Thr | Gly | 35  | 40  | 45  |     |
| Cys | Asn | Lys | Leu | Ala | Asp | Ala | Val | Ser | Val | Thr | Leu | Gly | Pro | Lys | Gly | 50  | 55  | 60  |     |
| Arg | Asn | Val | Ile | Ile | Glu | Gln | Ser | Phe | Gly | Ser | Pro | Lys | Ile | Thr | Lys | 65  | 70  | 75  | 80  |
| Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | Ile | Glu | Phe | Asn | Asn | Lys | Leu | Ala | 85  | 90  | 95  |     |
| Asn | Leu | Gly | Ala | Gln | Met | Val | Lys | Gln | Val | Ala | Ala | Asn | Thr | Asn | Gly | 100 | 105 | 110 |     |
| Lys | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Ile | Leu | Ala | Arg | Ser | Ile | 115 | 120 | 125 |     |
| Phe | Gln | Gln | Gly | Cys | Lys | Ala | Val | Asp | Ser | Gly | Met | Asn | Pro | Met | Asp | 130 | 135 | 140 |     |
| Leu | Leu | Arg | Gly | Ile | Asn | Lys | Gly | Val | Glu | Lys | Val | Leu | Glu | Tyr | Leu | 145 | 150 | 155 | 160 |
| Asn | Ser | Ile | Lys | Lys | Asp | Val | Thr | Thr | Thr | Glu | Glu | Ile | Phe | Asn | Val | 165 | 170 | 175 |     |
| Ala | Ser | Ile | Ser | Asn | Gly | Asp | Lys | Asn | Ile | Gly | Gln | Leu | Ile | Ala | Asp | 180 | 185 | 190 |     |
| Thr | Met | Lys | Lys | Val | Gly | Lys | Glu | Gly | Thr | Ile | Thr | Val | Thr | Glu | Gly | 195 | 200 | 205 |     |
| Lys | Thr | Leu | Gln | His | Glu | Leu | Glu | Ile | Val | Glu | Gly | Ile | Lys | Phe | Asp | 210 | 215 | 220 |     |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Asn | Asn | Ser | Gln | Lys | Val | Glu | 225 | 230 | 235 | 240 |
| Leu | Asp | Lys | Pro | Tyr | Ile | Leu | Ile | His | Glu | Lys | Lys | Ile | Ser | Thr | Val | 245 | 250 |     | 255 |
| Lys | Ser | Leu | Leu | Pro | Val | Leu | Glu | His | Val | Leu | Gln | Asn | Gln | Ser | Ser | 260 | 265 |     | 270 |
| Leu | Leu | Val | Ile | Ala | Glu | Asp | Val | Asp | Ser | Asp | Ala | Leu | Ala | Thr | Leu | 275 | 280 |     | 285 |
| Ile | Val | Asn | Lys | Leu | Arg | Leu | Gly | Leu | Lys | Ile | Cys | Ala | Val | Lys | Ala | 290 | 295 | 300 |     |
| Pro | Gly | Phe | Gly | Glu | His | Arg | Lys | Ala | Leu | Ile | His | Asp | Ile | Ala | Val | 305 | 310 | 315 | 320 |
| Met | Thr | Gly | Ala | Lys | Val | Ile | Thr | Glu | Glu | Thr | Gly | Leu | Lys | Leu | Asp | 325 | 330 |     | 335 |
| Asp | Pro | Gln | Val | Val | Ser | Tyr | Leu | Gly | Lys | Ala | Lys | Ser | Ile | Asn | Val | 340 | 345 |     | 350 |
| Thr | Lys | Asp | Ser | Thr | Leu | Ile | Met | Glu | Gly | Glu | Gly | Lys | Lys | Glu | Glu | 355 | 360 |     | 365 |
| Ile | Asn | Glu | Arg | Cys | Glu | Ser | Ile | Arg | Asn | Ala | Ile | Lys | Met | Asn | Thr | 370 | 375 | 380 |     |
| Ser | Asp | Tyr | Glu | Lys | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | Lys | Ile | Thr | 385 | 390 | 395 | 400 |
| Gly | Gly | Val | Ala | Leu | Ile | Lys | Val | Gly | Gly | Ile | Ser | Glu | Val | Glu | Val | 405 | 410 |     | 415 |
| Asn | Glu | Ile | Lys | Asp | Arg | Ile | Gln | Asp | Ala | Leu | Cys | Ala | Thr | Lys | Ala | 420 | 425 |     | 430 |
| Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Ser | Ala | Leu | Leu | Phe | 435 | 440 |     | 445 |
| Ala | Ser | Lys | Glu | Leu | Asp | Ser | Val | Gln | Thr | Asp | Asn | Tyr | Asp | Gln | Arg | 450 | 455 | 460 |     |
| Val | Gly | Val | Asn | Ile | Ile | Lys | Asp | Ala | Cys | Lys | Ala | Pro | Ile | Lys | Gln | 465 | 470 | 475 | 480 |
| Ile | Ala | Glu | Asn | Ala | Gly | His | Glu | Gly | Ser | Val | Val | Ala | Gly | Asn | Ile | 485 | 490 |     | 495 |
| Leu | Lys | Asp | Lys | Asn | Ser | Asn | Ile | Gly | Phe | Asn | Ala | Gln | Glu | Gly | Lys | 500 | 505 |     | 510 |
| Tyr | Val | Asp | Met | Ile | Glu | Ser | Gly | Ile | Ile | Asp | Pro | Thr | Lys | Val | Val | 515 | 520 |     | 525 |

Lys Thr Ala Ile Ser Asp Ala Ala Ser Ile Ala Ser Leu Met Thr Thr  
 530 535 540  
 Thr Glu Val Ala Ile Val Asp Phe Lys Asp Ser Lys Asn Glu Glu Ser  
 545 550 555 560  
 Ser Gln His Met Asn Ser Val Asn Ser Met Gly Asp Met Gly Gly Met  
 565 570 575  
 Tyr

(2) INFORMATION FOR SEQ ID NO:27:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 550 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

Met Thr Asn Val Val Val Ser Gly Glu Gln Leu Gln Gln Ala Phe Arg  
 1 5 10 15  
 Glu Val Ala Ala Val Ile Asp Ser Thr Val Ala Val Thr Ala Gly Pro  
 20 25 30  
 Arg Gly Lys Thr Val Gly Ile Asn Lys Pro Tyr Gly Ala Pro Glu Ile  
 35 40 45  
 Thr Lys Asp Gly Tyr Lys Val Met Lys Gly Ile Lys Pro Glu Lys Pro  
 50 55 60  
 Leu Asn Ala Ala Ile Thr Ser Ile Phe Ala Gln Ser Cys Ser Gln Cys  
 65 70 75 80  
 Asn Asp Lys Val Gly Asp Gly Thr Thr Thr Cys Ser Ile Leu Thr Ser  
 85 90 95  
 Gly Met Ile Val Glu Ala Ser Lys Ser Ile Ala Ala Gly Asn Asp Arg  
 100 105 110  
 Ile Ser Ile Lys Asn Gly Met Gln Lys Ala Lys Asp Val Val Leu Lys  
 115 120 125  
 Glu Val Ala Ser Met Ala Arg Thr Ile Ser Leu Glu Lys Ile Asp Glu  
 130 135 140  
 Val Ala Gln Val Ala Ile Ile Ser Ala Asn Gly Asp Arg Ser Ile Gly  
 145 150 155 160  
 Ser Asn Ile Ala Asp Ala Val Lys Lys Val Gly Lys Glu Gly Val Ile  
 165 170 175

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Thr | Val | Glu | Glu | Ser | Lys | Gly | Ser | Lys | Glu | Leu | Glu | Val | Glu | Leu | Thr | 180 | 185 | 190 |     |
| Thr | Gly | Met | Gln | Phe | Asp | Arg | Gly | Tyr | Leu | Ser | Pro | Tyr | Phe | Ile | Thr | 195 | 200 | 205 |     |
| Asn | Asn | Glu | Lys | Met | Ile | Val | Glu | Leu | Asp | Asp | Pro | Tyr | Leu | Leu | Ile | 210 | 215 | 220 |     |
| Thr | Glu | Lys | Lys | Leu | Asn | Ile | Ile | Gln | Pro | Leu | Leu | Ser | Ile | Leu | Glu | 225 | 230 | 235 | 240 |
| Ala | Val | Val | Lys | Ser | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Ile | 245 | 250 | 255 |     |
| Glu | Gly | Glu | Ala | Leu | Ser | Thr | Leu | Val | Ile | Asn | Lys | Leu | Arg | Gly | Gly | 260 | 265 | 270 |     |
| Leu | Lys | Val | Ala | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | 275 | 280 | 285 |     |
| Glu | Met | Leu | Glu | Asp | Ile | Ala | Ala | Leu | Thr | Asn | Ala | Lys | Tyr | Val | Ile | 290 | 295 | 300 |     |
| Lys | Asp | Glu | Leu | Gly | Ile | Lys | Met | Glu | Asp | Leu | Thr | Leu | Glu | Asp | Leu | 305 | 310 | 315 | 320 |
| Gly | Ile | Ala | Lys | Asn | Val | Lys | Ile | Thr | Lys | Asp | Asn | Thr | Thr | Ile | Val | 325 | 330 | 335 |     |
| Ser | Glu | Asn | Arg | Val | Thr | Asp | Arg | Val | Lys | Ala | Arg | Ile | Glu | Gln | Ile | 340 | 345 | 350 |     |
| Lys | Ser | Gln | Ile | Glu | Ser | Ser | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | 355 | 360 | 365 |     |
| Arg | Glu | Arg | Leu | Ala | Lys | Leu | Ser | Gly | Gly | Val | Ala | Val | Leu | Lys | Val | 370 | 375 | 380 |     |
| Gly | Gly | Ala | Thr | Glu | Leu | Glu | Val | Lys | Glu | Arg | Arg | Asp | Arg | Val | Glu | 385 | 390 | 395 | 400 |
| Asp | Gln | Leu | His | Ala | Thr | Arg | Ala | Ala | Ile | Glu | Glu | Gly | Ile | Val | Pro | 405 | 410 | 415 |     |
| Gly | Gly | Gly | Val | Ala | Leu | Leu | Tyr | Ala | Ser | Ser | Ala | Leu | Asp | Lys | Leu | 420 | 425 | 430 |     |
| Lys | Gly | Ala | Asp | Asp | Glu | Glu | Gln | Ile | Gly | Ile | Asn | Ile | Ile | Lys | Lys | 435 | 440 | 445 |     |
| Val | Leu | Ser | Val | Pro | Ile | Lys | Arg | Leu | Val | Lys | Asn | Ala | Gly | Leu | Glu | 450 | 455 | 460 |     |
| Ser | Ala | Val | Ile | Ile | Asp | Tyr | Leu | Ile | Lys | Gln | Asn | Asn | Lys | Glu | Leu | 465 | 470 | 475 | 480 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Tyr | Asn | Val | Glu | Ala | Met | Ser | Tyr | Ala | Asn | Ala | Phe | Ala | Ala | Gly |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Val | Ile | Asp | Pro | Ala | Lys | Val | Val | Arg | Ile | Ala | Phe | Glu | Thr | Ala | Ile |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Ser | Val | Ala | Ser | Val | Leu | Ile | Thr | Thr | Glu | Ser | Met | Ile | Val | Asp | Ile |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Pro | Asn | Lys | Asp | Glu | Asn | Ala | Ser | Ser | Pro | Met | Gly | Ala | Gly | Gly | Met |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Gly | Arg | Met | Asn | Asp | Phe |     |     |     |     |     |     |     |     |     |     |
| 545 |     |     |     |     | 550 |     |     |     |     |     |     |     |     |     |     |

(2) INFORMATION FOR SEQ ID NO:28:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 568 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Arg | Leu | Ala | Arg | Lys | Gly | Leu | Gln | Thr | Ala | Val | Val | Arg | Ser |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |
| Tyr | Ala | Lys | Asp | Val | Lys | Phe | Gly | Ala | Glu | Gly | Arg | Gln | Ala | Met | Leu |
|     |     | 20  |     |     |     |     | 25  |     |     |     |     |     | 30  |     |     |
| Val | Gly | Val | Asn | Leu | Leu | Ala | Asp | Ala | Val | Ser | Val | Thr | Met | Gly | Pro |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |
| Lys | Gly | Arg | Asn | Val | Ile | Ile | Glu | Gln | Ser | Trp | Gly | Ser | Pro | Lys | Ile |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |
| Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | Ile | Asp | Leu | Lys | Asp | Lys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     | 80  |     |
| Tyr | Gln | Asn | Leu | Gly | Ala | Lys | Leu | Ile | Gln | Asp | Val | Ala | Asn | Lys | Ala |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Asn | Glu | Glu | Ala | Gly | Asp | Gly | Thr | Thr | Cys | Ala | Thr | Val | Leu | Thr | Arg |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Ala | Ile | Ala | Lys | Glu | Gly | Phe | Glu | Arg | His | Ser | Ser | Arg | Gly | Asn | Ala |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |
| Val | Glu | Ile | Arg | Arg | Gly | Val | Met | Asn | Ala | Val | Glu | Val | Val | Val | Ala |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Glu | Leu | Lys | Lys | Ile | Ser | Lys | Lys | Val | Thr | Thr | Pro | Glu | Glu | Ile | Ala |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | Thr | Val | Val | Gly | Asn | Leu |  |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Ile | Ser | Asp | Ala | Met | Lys | Lys | Val | Gly | Thr | Thr | Gly | Val | Ile | Thr | Val |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |
| Lys | Asp | Gly | Lys | Thr | Leu | Asn | Asp | Gln | Leu | Glu | Leu | Ile | Glu | Gly | Met |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |
| Lys | Phe | Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Thr | Ser | Ala | Lys |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Gly | Ala | Lys | Val | Glu | Tyr | Glu | Lys | Ala | Leu | Val | Leu | Leu | Ser | Glu | Lys |  |  |
| 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     |     | 240 |  |  |
| Lys | Ile | Ser | Gln | Val | Gln | Asp | Ile | Val | Pro | Ala | Leu | Glu | Leu | Ala | Asn |  |  |
|     |     |     | 245 |     |     |     |     | 250 |     |     |     |     |     | 255 |     |  |  |
| Lys | Leu | Arg | Arg | Pro | Leu | Val | Ile | Ile | Ala | Glu | Asp | Val | Asp | Gly | Glu |  |  |
|     |     | 260 |     |     |     |     | 265 |     |     |     |     |     | 270 |     |     |  |  |
| Ala | Leu | Thr | Thr | Leu | Val | Leu | Asn | Arg | Leu | Lys | Val | Gly | Leu | Gln | Val |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |
| Val | Ala | Ile | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Asn | Arg | Lys | Asn | Ala | Leu |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |
| Lys | Asp | Met | Gly | Ile | Ala | Thr | Gly | Ala | Ser | Ile | Phe | Gly | Asp | Glu | Thr |  |  |
| 305 |     |     |     | 310 |     |     |     |     |     | 315 |     |     |     |     | 320 |  |  |
| Leu | Asp | Leu | Arg | Leu | Glu | Asp | Ile | Thr | Ala | Asn | Asp | Leu | Gly | Glu | Val |  |  |
|     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |     |  |  |
| Asp | Glu | Val | Thr | Ile | Thr | Lys | Asp | Asp | Thr | Leu | Leu | Leu | Arg | Gly | Arg |  |  |
|     |     | 340 |     |     |     |     | 345 |     |     |     |     |     | 350 |     |     |  |  |
| Gly | Asp | Gln | Thr | Glu | Ile | Glu | Lys | Arg | Ile | Glu | Glu | Ile | Thr | Asp | Glu |  |  |
|     | 355 |     |     |     |     | 360 |     |     |     |     |     | 365 |     |     |     |  |  |
| Ile | Glu | Arg | Ser | Thr | Ser | Asp | Tyr | Glu | Lys | Glu | Lys | Leu | Asn | Glu | Arg |  |  |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |  |
| Leu | Ala | Lys | Leu | Ser | Lys | Gly | Val | Ala | Val | Leu | Lys | Ile | Gly | Gly | Gly |  |  |
| 385 |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     |     | 400 |  |  |
| Ser | Glu | Val | Glu | Val | Gly | Glu | Lys | Lys | Asp | Arg | Val | Thr | Asp | Ala | Leu |  |  |
|     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |     |  |  |
| Cys | Ala | Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly |  |  |
|     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |     |  |  |
| Val | Ala | Leu | Leu | Arg | Ser | Leu | Thr | Ala | Leu | Lys | Asn | Tyr | Lys | Ala | Ala |  |  |
|     | 435 |     |     |     |     | 440 |     |     |     |     |     | 445 |     |     |     |  |  |
| Asn | Glu | Asp | Gln | Gln | Ile | Gly | Val | Asn | Ile | Val | Lys | Lys | Ala | Leu | Thr |  |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Gln | Pro | Ile | Ala | Thr | Ile | Val | Lys | Asn | Ala | Gly | Leu | Glu | Pro | Ser | Ser | 465 | 470 | 475 | 480 |
| Ile | Ile | Asp | Glu | Val | Thr | Gly | Asn | Ser | Asn | Thr | Ser | Tyr | Gly | Tyr | Asp | 485 | 490 | 495 |     |
| Ala | Leu | Asn | Gly | Lys | Phe | Val | Asp | Met | Phe | Glu | Ala | Gly | Ile | Ile | Asp | 500 | 505 | 510 |     |
| Pro | Thr | Lys | Val | Val | Arg | Thr | Ala | Leu | Gln | Asp | Ala | Ser | Gly | Val | Ala | 515 | 520 | 525 |     |
| Ser | Leu | Leu | Ala | Thr | Thr | Glu | Cys | Val | Val | Thr | Glu | Ile | Pro | Lys | Glu | 530 | 535 | 540 |     |
| Glu | Ala | Val | Gly | Gly | Pro | Ala | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | 545 | 550 | 555 | 560 |
| Gly | Gly | Met | Gly | Gly | Met | Gly | Phe |     |     |     |     |     |     |     |     | 565 |     |     |     |

(2) INFORMATION FOR SEQ ID NO:29:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 576 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Met | Phe | Arg | Leu | Pro | Val | Ser | Leu | Ala | Arg | Ser | Ser | Ile | Ser | Arg | Gln | 1   | 5   | 10  | 15 |
| Leu | Ala | Met | Arg | Gly | Tyr | Ala | Lys | Asp | Val | Arg | Phe | Gly | Pro | Glu | Val | 20  | 25  | 30  |    |
| Arg | Ala | Met | Met | Leu | Gln | Gly | Val | Asp | Val | Leu | Ala | Asp | Ala | Val | Ala | 35  | 40  | 45  |    |
| Val | Thr | Met | Gly | Pro | Lys | Gly | Arg | Asn | Val | Ile | Ile | Glu | Gln | Ser | Val | 50  | 55  | 60  |    |
| Gly | Leu | Ala | Lys | Ile | Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | Ile | 65  | 70  | 75  | 80 |
| Glu | Leu | Lys | Asp | Lys | Phe | Gln | Asn | Ile | Gly | Ala | Lys | Leu | Val | Gln | Asp | 85  | 90  | 95  |    |
| Leu | Ala | Asn | Asn | Thr | Asn | Glu | Glu | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | 100 | 105 | 110 |    |
| Thr | Phe | Leu | Ala | Arg | Ala | Ile | Ala | Lys | Glu | Gly | Phe | Glu | Lys | Ile | Ser | 115 | 120 | 125 |    |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Gly | Gly | Asn | Pro | Val | Glu | Ile | Arg | Arg | Gly | Val | Met | Leu | Ala | Val | 130 | 135 | 140 |     |
| Glu | Thr | Val | Lys | Asp | Asn | Leu | Lys | Thr | Met | Ser | Arg | Pro | Val | Ser | Thr | 145 | 150 | 155 | 160 |
| Pro | Glu | Glu | Ile | Ala | Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | Arg | 165 | 170 | 175 |     |
| Glu | Ile | Gly | Asn | Gly | Lys | Val | Ser | Val | Ser | Glu | Ala | Met | Lys | Lys | Val | 180 | 185 | 190 |     |
| Gly | Arg | Asp | Gly | Val | Ile | Thr | Val | Lys | Asp | Gly | Lys | Thr | Leu | Thr | Asp | 195 | 200 | 205 |     |
| Glu | Leu | Glu | Val | Ile | Glu | Gly | Thr | Met | Arg | Phe | Asp | Arg | Gly | Tyr | Ile | 210 | 215 | 220 |     |
| Ser | Pro | Tyr | Phe | Ile | Asn | Ser | Ser | Lys | Gly | Ala | Lys | Val | Glu | Phe | Gln | 225 | 230 | 235 | 240 |
| Asp | Ala | Leu | Leu | Leu | Leu | Ser | Glu | Lys | Lys | Ile | Ser | Ser | Val | Ala | Glu | 245 | 250 | 255 |     |
| His | His | Ser | Pro | Leu | Trp | Arg | Leu | Ala | Ser | Arg | Arg | Thr | Arg | Lys | Pro | 260 | 265 | 270 |     |
| Leu | Val | Ile | Ile | Ala | Glu | Asp | Ile | Asp | Gly | Glu | Ala | Leu | Ser | Thr | Leu | 275 | 280 | 285 |     |
| Val | Val | Asn | Arg | Leu | Lys | Ile | Gly | Leu | Gln | Val | Ala | Ala | Val | Lys | Ala | 290 | 295 | 300 |     |
| Pro | Gly | Phe | Gly | Asp | Asn | Arg | Lys | Ser | Thr | Leu | Thr | Asp | Met | Ala | Thr | 305 | 310 | 315 | 320 |
| Ser | Gly | Gly | Ile | Val | Phe | Gly | Asp | Asp | Val | Ser | Leu | Val | Lys | Leu | Glu | 325 | 330 | 335 |     |
| Asp | Val | Lys | Val | Ser | Asp | Leu | Gly | Gln | Val | Gly | Glu | Val | Val | Ile | Thr | 340 | 345 | 350 |     |
| Lys | Asp | Asp | Thr | Leu | Leu | Leu | Lys | Gly | Lys | Gly | Lys | Lys | Asp | Asp | Val | 355 | 360 | 365 |     |
| Leu | Arg | Arg | Ala | Asn | Gln | Ile | Arg | Thr | Lys | Ile | Glu | Asp | Thr | Thr | Ser | 370 | 375 | 380 |     |
| Glu | Tyr | Glu | Lys | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala | Arg | Leu | Ala | Ser | 385 | 390 | 395 | 400 |
| Gly | Val | Ala | Leu | Arg | Val | Gly | Gly | Ser | Ser | Glu | Val | Glu | Val | Asn | Glu | 405 | 410 | 415 |     |
| Lys | Lys | Asp | Arg | Val | His | Asp | Ala | Leu | Asn | Ala | Thr | Arg | Ala | Ala | Val | 420 | 425 | 430 |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Arg | Pro | Leu | Leu | Arg | Cys | Ile | 435 | 440 | 445 |
| Glu | Lys | Leu | Glu | Gly | Val | Glu | Thr | Thr | Asn | Glu | Asp | Gln | Lys | Leu | Gly | 450 | 455 | 460 |
| Val | Glu | Ile | Val | Arg | Arg | Ala | Leu | Arg | Met | Pro | Cys | Met | Thr | Ile | Ala | 465 | 470 | 475 |
| Lys | Asn | Ala | Gly | Val | Asp | Gly | Ala | Met | Val | Val | Ala | Lys | Val | Glu | Asn | 485 | 490 | 495 |
| Gln | Ala | Gly | Asp | Tyr | Gly | Tyr | Asp | Ala | Lys | Gly | Glu | Tyr | Gly | Asn | Leu | 500 | 505 | 510 |
| Ile | Glu | Lys | Gly | Ile | Ile | Asp | Pro | Thr | Lys | Val | Val | Arg | Thr | Ala | Ile | 515 | 520 | 525 |
| Thr | Asp | Ala | Ser | Gly | Val | Ala | Ser | Leu | Leu | Thr | Thr | Ala | Glu | Ala | Val | 530 | 535 | 540 |
| Val | Thr | Glu | Ile | Pro | Lys | Glu | Asp | Gly | Ala | Pro | Ala | Met | Pro | Gly | Met | 545 | 550 | 555 |
| Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met | Met | 565 | 570 | 575 |

(2) INFORMATION FOR SEQ ID NO:30:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 573 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |    |    |    |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|
| Met | Leu | Arg | Leu | Pro | Thr | Val | Phe | Arg | Gln | Met | Arg | Pro | Val | Ser | Arg | 1  | 5  | 10 | 15 |
| Val | Leu | Ala | Pro | His | Leu | Thr | Arg | Ala | Tyr | Ala | Lys | Asp | Val | Lys | Phe | 20 | 25 | 30 |    |
| Gly | Ala | Asp | Ala | Arg | Ala | Leu | Met | Leu | Gln | Gly | Val | Asp | Leu | Leu | Ala | 35 | 40 | 45 |    |
| Asp | Ala | Val | Ala | Val | Thr | Met | Gly | Pro | Lys | Gly | Arg | Thr | Val | Ile | Ile | 50 | 55 | 60 |    |
| Glu | Gln | Gly | Trp | Gly | Ser | Pro | Lys | Val | Thr | Lys | Asp | Gly | Val | Thr | Val | 65 | 70 | 75 | 80 |
| Ala | Lys | Ser | Ile | Asp | Leu | Lys | Asp | Lys | Tyr | Lys | Asn | Ile | Gly | Ala | Lys |    |    |    |    |



| 85  |     |     |     |     |     |     |     | 90  |     |     |     | 95  |     |     |     |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| Leu | Val | Gln | Asp | Val | Ala | Asn | Asn | Thr | Asn | Glu | Glu | Ala | Gly | Asp | Gly |  |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |  |  |
| Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Arg | Ser | Ile | Ala | Lys | Glu | Gly | Phe |  |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |  |
| Glu | Lys | Ile | Ser | Lys | Gly | Ala | Asn | Pro | Val | Glu | Ile | Arg | Arg | Gly | Val |  |  |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |  |
| Met | Leu | Ala | Val | Asp | Ala | Val | Ile | Ala | Glu | Leu | Lys | Lys | Gln | Ser | Lys |  |  |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |  |  |
| Pro | Val | Thr | Thr | Pro | Glu | Glu | Ile | Ala | Gln | Val | Ala | Thr | Ile | Ser | Ala |  |  |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |  |
| Asn | Gly | Asp | Lys | Glu | Ile | Gly | Asn | Ile | Ile | Ser | Asp | Ala | Met | Lys | Lys |  |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |  |
| Val | Gly | Arg | Lys | Gly | Val | Ile | Thr | Val | Lys | Asp | Gly | Lys | Thr | Leu | Asn |  |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |  |
| Asp | Glu | Leu | Glu | Ile | Ile | Glu | Gly | Met | Lys | Phe | Asp | Arg | Gly | Tyr | Ile |  |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |  |
| Ser | Pro | Tyr | Phe | Ile | Asn | Thr | Ser | Lys | Gly | Gln | Lys | Cys | Glu | Phe | Gln |  |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |  |
| Asp | Ala | Tyr | Val | Leu | Leu | Ser | Glu | Lys | Lys | Ile | Ser | Ser | Ile | Gln | Ser |  |  |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |  |  |
| Ile | Val | Pro | Ala | Leu | Glu | Ile | Ala | Asn | Ala | His | Arg | Lys | Pro | Leu | Val |  |  |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |  |  |
| Ile | Ile | Ala | Glu | Asp | Val | Asp | Gly | Glu | Ala | Leu | Ser | Thr | Leu | Val | Leu |  |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |  |
| Asn | Arg | Leu | Lys | Val | Gly | Leu | Gln | Val | Val | Ala | Val | Lys | Ala | Pro | Gly |  |  |  |
|     |     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |  |
| Phe | Gly | Asp | Asn | Arg | Lys | Asn | Gln | Leu | Lys | Asp | Met | Ala | Ile | Ala | Thr |  |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |  |
| Gly | Gly | Ala | Val | Phe | Gly | Glu | Glu | Gly | Leu | Thr | Leu | Asn | Leu | Glu | Asp |  |  |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |  |  |
| Val | Gln | Pro | His | Asp | Leu | Gly | Lys | Val | Gly | Glu | Val | Ile | Val | Thr | Lys |  |  |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |  |  |
| Asp | Asp | Ala | Met | Leu | Leu | Lys | Gly | Lys | Gly | Asp | Lys | Ala | Gln | Ile | Glu |  |  |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |  |  |
| Lys | Arg | Ile | Gln | Glu | Ile | Ile | Glu | Gln | Leu | Asp | Val | Thr | Thr | Ser | Glu |  |  |  |
|     |     | 370 |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |  |  |  |
| Tyr | Glu | Lys | Glu | Lys | Leu | Asn | Glu | Arg | Leu | Ala | Lys | Leu | Ser | Asp | Gly |  |  |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |  |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| Val | Ala | Val | Leu | Lys | Val | Gly | Gly | Thr | Ser | Asp | Val | Glu | Val | Asn | Glu |  |  |  |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |  |  |  |
| Lys | Lys | Asp | Arg | Val | Thr | Asp | Ala | Leu | Asn | Ala | Thr | Arg | Ala | Ala | Val |  |  |  |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |  |  |  |
| Glu | Glu | Gly | Ile | Val | Leu | Gly | Gly | Gly | Cys | Ala | Leu | Leu | Arg | Cys | Ile |  |  |  |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |  |  |  |
| Pro | Ala | Leu | Asp | Ser | Leu | Thr | Pro | Ala | Asn | Glu | Asp | Gln | Lys | Ile | Gly |  |  |  |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |  |  |  |
| Ile | Glu | Ile | Ile | Lys | Arg | Thr | Leu | Lys | Ile | Pro | Ala | Met | Thr | Ile | Ala |  |  |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |  |  |  |
| Lys | Asn | Ala | Gly | Val | Glu | Gly | Ser | Leu | Ile | Val | Glu | Lys | Ile | Met | Gln |  |  |  |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |  |  |  |
| Ser | Ser | Ser | Glu | Val | Gly | Tyr | Asp | Ala | Met | Ala | Gly | Asp | Phe | Val | Asn |  |  |  |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |  |  |  |
| Met | Val | Glu | Lys | Gly | Ile | Ile | Asp | Pro | Thr | Lys | Val | Val | Arg | Thr | Ala |  |  |  |
|     | 515 |     |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |  |  |  |
| Leu | Leu | Asp | Ala | Ala | Gly | Val | Ala | Ser | Leu | Leu | Thr | Thr | Ala | Glu | Val |  |  |  |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |  |  |  |
| Val | Val | Thr | Glu | Ile | Pro | Lys | Glu | Glu | Lys | Asp | Pro | Gly | Met | Gly | Ala |  |  |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |  |  |  |
| Met | Gly | Gly | Met | Gly | Gly | Gly | Met | Gly | Gly | Gly | Met | Phe |     |     |     |  |  |  |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     |     |  |  |  |

(2) INFORMATION FOR SEQ ID NO:31:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 577 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|--|
| Met | Tyr | Arg | Phe | Ala | Ser | Asn | Leu | Ala | Ser | Lys | Ala | Arg | Ile | Ala | Gln |  |  |  |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |  |  |
| Asn | Ala | Arg | Gln | Val | Ser | Ser | Arg | Met | Ser | Trp | Ser | Arg | Asn | Tyr | Ala |  |  |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |  |  |
| Ala | Lys | Glu | Ile | Lys | Phe | Gly | Val | Glu | Ala | Arg | Ala | Leu | Met | Leu | Lys |  |  |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |  |  |
| Gly | Val | Glu | Asp | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Met | Gly | Pro | Lys |  |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| 50  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
| Gly | Arg | Asn | Val | Val | Ile | Glu | Gln | Ser | Trp | Gly | Ala | Pro | Lys | Val | Thr |  |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |  |
| Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | Ile | Glu | Phe | Lys | Asp | Lys | Ile |  |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |  |
| Lys | Asn | Val | Gly | Ala | Ser | Leu | Val | Lys | Gln | Val | Ala | Asn | Ala | Thr | Asn |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |  |
| Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Cys | Ala | Thr | Val | Leu | Thr | Arg | Ala |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |
| Ile | Phe | Ala | Glu | Gly | Cys | Lys | Ser | Val | Ala | Ala | Gly | Met | Asn | Ala | Met |  |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |
| Asp | Leu | Arg | Arg | Gly | Ile | Ser | Met | Ala | Val | Asp | Ala | Val | Val | Thr | Asn |  |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |  |
| Leu | Lys | Ser | Lys | Ala | Arg | Met | Ile | Ser | Thr | Ser | Glu | Glu | Ile | Ala | Gln |  |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Val | Gly | Thr | Ile | Ser | Ala | Asn | Gly | Glu | Arg | Glu | Ile | Gly | Glu | Leu | Ile |  |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |
| Ala | Lys | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr | Ile | Gln |  |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |  |
| Asp | Gly | Lys | Thr | Leu | Phe | Asn | Glu | Leu | Glu | Val | Val | Glu | Gly | Met | Lys |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Leu | Asp | Arg | Gly | Tyr | Thr | Ser | Pro | Tyr | Phe | Ile | Thr | Asn | Gln | Lys | Thr |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |
| Gln | Lys | Cys | Glu | Leu | Asp | Asp | Pro | Leu | Ile | Leu | Ile | His | Glu | Lys | Lys |  |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |  |  |
| Ile | Ser | Ser | Ile | Asn | Ser | Ile | Val | Lys | Val | Leu | Glu | Leu | Ala | Leu | Lys |  |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |  |
| Arg | Gln | Arg | Pro | Leu | Leu | Ile | Val | Ser | Glu | Asp | Val | Glu | Ser | Asp | Ala |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |
| Leu | Ala | Thr | Leu | Ile | Leu | Asn | Lys | Leu | Arg | Ala | Gly | Ile | Lys | Val | Cys |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |
| Ala | Ile | Lys | Ala | Pro | Gly | Phe | Gly | Glu | Asn | Arg | Lys | Ala | Asn | Leu | Gln |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |
| Asp | Leu | Ala | Ala | Leu | Thr | Gly | Gly | Glu | Val | Ile | Thr | Asp | Glu | Leu | Gly |  |  |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |  |  |
| Met | Asn | Leu | Glu | Lys | Val | Asp | Leu | Ser | Met | Leu | Gly | Thr | Cys | Lys | Lys |  |  |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |  |  |
| Val | Thr | Val | Ser | Lys | Asp | Asp | Thr | Val | Ile | Leu | Asp | Gly | Ala | Gly | Asp |  |  |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |  |  |



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
| 1   |     | 5   |     | 10  |     | 15  |     |     |     |     |     |     |     |     |     |  |  |
| Ser | Ser | Ser | Ala | Ala | Arg | Gln | Val | Gly | Ser | Arg | Leu | Ala | Trp | Ser | Arg |  |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |  |
| Asn | Tyr | Ala | Ala | Lys | Asp | Ile | Lys | Phe | Gly | Val | Glu | Ala | Arg | Ala | Leu |  |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |  |
| Met | Leu | Arg | Gly | Val | Glu | Glu | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Met |  |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |  |  |
| Gly | Pro | Lys | Gly | Arg | Asn | Val | Val | Ile | Glu | Gln | Ser | Phe | Gly | Ala | Pro |  |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |  |
| Lys | Val | Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Ser | Ile | Glu | Phe | Lys |  |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |  |
| Asp | Arg | Val | Lys | Asn | Val | Gly | Ala | Ser | Leu | Val | Lys | Gln | Val | Ala | Asn |  |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |  |
| Ala | Thr | Asn | Asp | Asn | Ala | Gly | Asp | Gly | Thr | Thr | Cys | Ala | Thr | Val | Leu |  |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |  |
| Thr | Lys | Ala | Ile | Phe | Thr | Glu | Gly | Cys | Lys | Ser | Val | Ala | Ala | Gly | Met |  |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |  |
| Asn | Ala | Met | Asp | Leu | Arg | Arg | Gly | Ile | Ser | Met | Ala | Val | Asp | Ala | Val |  |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |  |
| Val | Thr | Asn | Leu | Lys | Gly | Met | Ala | Arg | Met | Ile | Ser | Thr | Ser | Glu | Glu |  |  |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |  |  |
| Ile | Ala | Gln | Val | Gly | Thr | Ile | Ser | Ala | Asn | Gly | Glu | Arg | Glu | Ile | Gly |  |  |
|     |     | 180 |     |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |  |
| Glu | Leu | Ile | Ala | Lys | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile |  |  |
|     | 195 |     |     |     |     | 200 |     |     |     |     |     | 205 |     |     |     |  |  |
| Thr | Ile | Ala | Asp | Gly | Asn | Thr | Leu | Tyr | Asn | Glu | Leu | Glu | Val | Val | Glu |  |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |  |  |
| Gly | Met | Lys | Leu | Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Thr | Asn |  |  |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |  |  |
| Ser | Lys | Ala | Gln | Lys | Cys | Glu | Pro | Glu | Asp | Pro | Leu | Ile | Leu | Ile | His |  |  |
|     |     |     | 245 |     |     |     |     |     | 250 |     |     |     | 255 |     |     |  |  |
| Asp | Arg | Lys | Val | Thr | Asn | Met | His | Ala | Val | Val | Lys | Val | Leu | Glu | Met |  |  |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |  |  |
| Ala | Leu | Lys | Lys | Gln | Arg | Pro | Leu | Leu | Ile | Val | Ala | Glu | Asp | Val | Glu |  |  |
|     |     | 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |  |  |
| Ser | Glu | Ala | Leu | Gly | Thr | Leu | Ile | Ile | Asn | Lys | Leu | Arg | Ala | Gly | Ile |  |  |
|     | 290 |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |  |  |
| Lys | Val | Cys | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Glu | Asn | Arg | Lys | Ala |  |  |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |  |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asn | Leu | Gln | Asp | Leu | Ala | Ile | Leu | Thr | Gly | Gly | Glu | Val | Ile | Thr | Glu | 325 | 330 | 335 |
| Glu | Leu | Gly | Met | Asn | Leu | Glu | Asn | Val | Glu | Pro | His | Met | Leu | Gly | Ser | 340 | 345 | 350 |
| Cys | Lys | Lys | Val | Thr | Val | Ser | Lys | Asp | Asp | Thr | Val | Ile | Leu | Asp | Gly | 355 | 360 | 365 |
| Ala | Gly | Asp | Lys | Lys | Ser | Ile | Glu | Glu | Arg | Ala | Asp | Gln | Ile | Arg | Ser | 370 | 375 | 380 |
| Ala | Val | Glu | Asn | Ser | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | Gln | Glu | 385 | 390 | 395 |
| Arg | Leu | Ala | Lys | Leu | Ser | Gly | Gly | Val | Ala | Val | Leu | Lys | Ile | Gly | Gly | 405 | 410 | 415 |
| Ala | Ser | Glu | Ala | Glu | Val | Gly | Glu | Lys | Lys | Asp | Arg | Val | Thr | Asp | Ala | 420 | 425 | 430 |
| Leu | Asn | Ala | Thr | Lys | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | 435 | 440 | 445 |
| Gly | Val | Ala | Leu | Leu | Tyr | Ala | Ser | Lys | Glu | Leu | Asp | Lys | Leu | Gln | Thr | 450 | 455 | 460 |
| Ala | Asn | Phe | Asp | Gln | Lys | Ile | Gly | Val | Gln | Ile | Ile | Gln | Asn | Ala | Leu | 465 | 470 | 475 |
| Lys | Thr | Pro | Val | His | Thr | Ile | Ala | Ser | Asn | Ala | Gly | Val | Glu | Gly | Ala | 485 | 490 | 495 |
| Val | Val | Val | Gly | Lys | Leu | Leu | Glu | Gln | Gly | Asn | Thr | Asp | Leu | Gly | Tyr | 500 | 505 | 510 |
| Asp | Ala | Ala | Lys | Asp | Glu | Tyr | Val | Asp | Met | Val | Lys | Ala | Gly | Ile | Ile | 515 | 520 | 525 |
| Asp | Pro | Leu | Lys | Val | Ile | Arg | Thr | Ala | Leu | Val | Asp | Ala | Ala | Ser | Val | 530 | 535 | 540 |
| Ser | Ser | Leu | Met | Thr | Thr | Thr | Glu | Ser | Ile | Ile | Val | Glu | Ile | Pro | Lys | 545 | 550 | 555 |
| Glu | Glu | Ala | Pro | Ala | Pro | Ala | Met | Gly | Gly | Met | Gly | Gly | Met | Asp | Tyr | 565 | 570 | 575 |

(2) INFORMATION FOR SEQ ID NO:33:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 587 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Ala | Ser | Thr | Asn | Ala | Leu | Ser | Ser | Thr | Ser | Ile | Leu | Arg | Ser | Pro |  |
| 1   |     |     |     | 5   |     |     |     |     | 10  |     |     |     |     | 15  |     |  |
| Thr | Asn | Gln | Ala | Gln | Thr | Ser | Leu | Ser | Lys | Lys | Val | Lys | Gln | His | Gly |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| Arg | Val | Asn | Phe | Arg | Gln | Lys | Pro | Asn | Arg | Phe | Val | Val | Lys | Ala | Ala |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| Ala | Lys | Asp | Ile | Ala | Phe | Asp | Gln | His | Ser | Arg | Ser | Ala | Met | Gln | Ala |  |
|     | 50  |     |     |     |     | 55  |     |     |     | 60  |     |     |     |     |     |  |
| Gly | Ile | Asp | Lys | Leu | Ala | Asp | Ala | Val | Gly | Leu | Thr | Leu | Gly | Pro | Arg |  |
| 65  |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |     |  |
| Gly | Arg | Asn | Val | Val | Leu | Asp | Glu | Phe | Gly | Ser | Pro | Lys | Val | Val | Asn |  |
|     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |     |  |
| Asp | Gly | Val | Thr | Ile | Ala | Arg | Ala | Ile | Glu | Leu | Pro | Asp | Pro | Met | Glu |  |
|     |     | 100 |     |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
| Asn | Ala | Gly | Ala | Ala | Leu | Ile | Arg | Glu | Val | Ala | Ser | Lys | Thr | Asn | Asp |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| Ser | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Ser | Ile | Leu | Ala | Arg | Glu | Ile |  |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
| Ile | Lys | Leu | Gly | Leu | Leu | Asn | Val | Thr | Ser | Gly | Ala | Asn | Pro | Val | Ser |  |
| 145 |     |     |     | 150 |     |     |     |     |     | 155 |     |     |     | 160 |     |  |
| Ile | Lys | Lys | Gly | Ile | Asp | Lys | Thr | Val | Ala | Ala | Leu | Val | Glu | Glu | Leu |  |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     | 175 |     |     |  |
| Glu | Lys | Leu | Ala | Arg | Pro | Val | Lys | Gly | Gly | Asp | Asp | Ile | Lys | Ala | Val |  |
|     |     | 180 |     |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| Ala | Thr | Ile | Ser | Ala | Gly | Asn | Asp | Glu | Leu | Ile | Gly | Lys | Met | Ile | Ala |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| Glu | Ala | Ile | Asp | Lys | Val | Gly | Pro | Asp | Gly | Val | Leu | Ser | Ile | Glu | Ser |  |
|     | 210 |     |     |     |     | 215 |     |     |     | 220 |     |     |     |     |     |  |
| Ser | Asn | Ser | Phe | Glu | Thr | Thr | Val | Glu | Val | Glu | Glu | Gly | Met | Glu | Ile |  |
| 225 |     |     |     | 230 |     |     |     |     |     | 235 |     |     |     | 240 |     |  |
| Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Gln | Phe | Val | Thr | Asn | Pro | Glu | Lys | Ser |  |
|     |     |     | 245 |     |     |     |     |     | 250 |     |     |     |     | 255 |     |  |
| Ile | Val | Glu | Phe | Glu | Asn | Ala | Arg | Val | Leu | Ile | Thr | Asp | Gln | Lys | Ile |  |
|     |     | 260 |     |     |     |     | 265 |     |     |     |     |     | 270 |     |     |  |
| Ser | Ala | Ile | Lys | Asp | Ile | Ile | Pro | Leu | Leu | Glu | Lys | Thr | Thr | Gln | Leu |  |

| 275 |     |     |     |     | 280 |     |     |     |     | 285 |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Arg | Ala | Pro | Leu | Leu | Ile | Ile | Ser | Glu | Asp | Ile | Thr | Gly | Glu | Ala | Leu |
| 290 |     |     |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Ala | Thr | Leu | Val | Val | Asn | Lys | Leu | Arg | Gly | Ile | Leu | Asn | Val | Ala | Ala |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Ile | Lys | Ala | Pro | Gly | Phe | Gly | Glu | Arg | Arg | Lys | Ala | Leu | Leu | Gln | Asp |
|     |     |     |     | 325 |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Ile | Ala | Ile | Leu | Thr | Gly | Ala | Glu | Phe | Gln | Ala | Ser | Asp | Leu | Gly | Leu |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |
| Leu | Val | Glu | Asn | Thr | Thr | Ile | Glu | Gln | Leu | Gly | Leu | Ala | Arg | Lys | Val |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |
| Thr | Ile | Ser | Lys | Asp | Ser | Thr | Thr | Ile | Ile | Ala | Asp | Ala | Ala | Ser | Lys |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |
| Asp | Glu | Leu | Gln | Ser | Arg | Val | Ala | Gln | Leu | Lys | Lys | Glu | Leu | Ser | Glu |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |
| Thr | Asp | Ser | Ile | Tyr | Asp | Ser | Glu | Lys | Leu | Ala | Glu | Arg | Ile | Ala | Lys |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |
| Leu | Ser | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Thr | Glu | Thr |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |
| Glu | Leu | Glu | Asp | Arg | Lys | Leu | Arg | Ile | Glu | Asp | Ala | Lys | Asn | Ala | Thr |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |
| Phe | Ala | Ala | Ile | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Thr | Ala | Leu |
|     | 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |
| Val | His | Leu | Ser | Gly | Tyr | Val | Pro | Ala | Ile | Lys | Glu | Lys | Leu | Glu | Asp |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |
| Ala | Asp | Glu | Arg | Leu | Gly | Ala | Asp | Ile | Val | Gln | Lys | Ala | Leu | Val | Ala |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |
| Pro | Ala | Ala | Leu | Ile | Ala | Gln | Asn | Ala | Gly | Ile | Glu | Gly | Glu | Val | Val |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |
| Val | Glu | Lys | Ile | Lys | Asn | Gly | Glu | Trp | Glu | Val | Gly | Tyr | Asn | Ala | Met |
|     |     | 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |
| Thr | Asp | Thr | Tyr | Glu | Asn | Leu | Val | Glu | Ser | Gly | Val | Ile | Asp | Pro | Ala |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |
| Lys | Val | Thr | Arg | Cys | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Val | Ala | Gly | Met |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |
| Val | Leu | Thr | Thr | Gln | Ala | Ile | Val | Val | Glu | Lys | Pro | Lys | Pro | Lys | Ala |
|     |     |     |     | 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |
| Ala | Val | Ala | Ala | Ala | Pro | Gln | Gly | Leu | Thr | Ile |     |     |     |     |     |
|     |     |     |     | 580 |     |     |     | 585 |     |     |     |     |     |     |     |



(2) INFORMATION FOR SEQ ID NO:34:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 545 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Met | Ala | Lys | Asp | Ile | Lys | Phe | Gly | Glu | Glu | Ala | Arg | Arg | Ala | Met | Leu |  |
| 1   |     |     |     | 5   |     |     |     | 10  |     |     |     |     |     | 15  |     |  |
| Arg | Gly | Val | Asn | Ala | Leu | Ala | Asp | Ala | Val | Lys | Val | Thr | Leu | Gly | Pro |  |
|     |     |     | 20  |     |     |     |     | 25  |     |     |     |     | 30  |     |     |  |
| Lys | Gly | Arg | Asn | Val | Val | Leu | Glu | Lys | Ser | Phe | Gly | Ala | Pro | Thr | Ile |  |
|     |     |     | 35  |     |     |     | 40  |     |     |     |     | 45  |     |     |     |  |
| Thr | Lys | Asp | Gly | Val | Thr | Val | Ala | Lys | Glu | Ile | Glu | Leu | Glu | Asp | Lys |  |
|     |     |     | 50  |     |     |     | 55  |     |     |     | 60  |     |     |     |     |  |
| Phe | Glu | Asn | Met | Gly | Ala | Gln | Leu | Val | Lys | Glu | Val | Ala | Ser | Lys | Thr |  |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |  |
| Asn | Asp | Val | Ala | Gly | Asp | Gly | Thr | Thr | Thr | Ala | Thr | Val | Leu | Ala | Gln |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |  |
| Ala | Ile | Val | Lys | Glu | Gly | Leu | Lys | Asn | Val | Ala | Ala | Gly | Ala | Asn | Pro |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |  |
| Met | Asp | Leu | Arg | Arg | Gly | Ile | Asp | Lys | Ala | Val | Asp | Ala | Val | Val | Glu |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |  |
| Glu | Leu | Lys | Ala | Ile | Ala | Lys | Pro | Val | Glu | Thr | Lys | Glu | Glu | Ile | Ala |  |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |  |
| Gln | Val | Ala | Thr | Ile | Ser | Ala | Asn | Gly | Asp | Glu | Glu | Ile | Gly | Glu | Leu |  |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |  |
| Ile | Ala | Glu | Ala | Met | Glu | Lys | Val | Gly | Lys | Glu | Gly | Val | Ile | Thr | Val |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |  |
| Glu | Glu | Gly | Lys | Thr | Leu | Glu | Thr | Glu | Leu | Glu | Val | Val | Glu | Gly | Met |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |  |
| Gln | Phe | Asp | Arg | Gly | Tyr | Ile | Ser | Pro | Tyr | Phe | Ile | Thr | Asp | Ser | Glu |  |
|     |     |     | 195 |     |     |     | 200 |     |     |     |     | 205 |     |     |     |  |
| Lys | Gln | Lys | Ala | Glu | Leu | Glu | Asp | Pro | Leu | Ile | Leu | Leu | Thr | Asp | Lys |  |
|     |     |     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |     |     |  |
| Lys | Ile | Ser | Asn | Ile | Gln | Asp | Leu | Leu | Pro | Val | Leu | Glu | Glu | Val | Ala |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 225 |     |     |     | 230 |     |     |     |     | 235 |     |     |     | 240 |     |     |
| Gln | Ala | Gly | Lys | Pro | Leu | Leu | Ile | Ile | Ala | Glu | Asp | Val | Glu | Gly | Glu |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     | 255 |     |     |
| Ala | Leu | Ala | Thr | Leu | Val | Val | Asn | Lys | Leu | Arg | Gly | Thr | Leu | Lys | Val |
|     |     |     |     | 260 |     |     |     |     | 265 |     |     |     | 270 |     |     |
| Val | Ala | Val | Lys | Ala | Pro | Gly | Phe | Gly | Asp | Arg | Arg | Lys | Ala | Met | Leu |
|     |     |     |     | 275 |     |     |     |     | 280 |     |     |     | 285 |     |     |
| Gln | Asp | Ile | Ala | Ile | Leu | Thr | Gly | Gly | Gln | Val | Ile | Ser | Glu | Glu | Leu |
|     |     |     |     | 290 |     |     |     |     | 295 |     |     |     | 300 |     |     |
| Gly | Leu | Ser | Leu | Glu | Asp | Ala | Thr | Leu | Glu | Asp | Leu | Gly | Gln | Ala | Lys |
|     |     |     |     | 305 |     |     |     |     | 310 |     |     |     | 315 |     |     |
| Lys | Val | Val | Val | Thr | Lys | Asp | Asp | Thr | Thr | Ile | Val | Asp | Gly | Ala | Gly |
|     |     |     |     | 320 |     |     |     |     | 325 |     |     |     | 330 |     |     |
| Asp | Ala | Ala | Ile | Ala | Gly | Arg | Val | Ala | Gln | Ile | Arg | Ser | Gln | Ile | Glu |
|     |     |     |     | 335 |     |     |     |     | 340 |     |     |     | 345 |     |     |
| Glu | Ser | Thr | Ser | Asp | Tyr | Asp | Lys | Glu | Lys | Leu | Gln | Glu | Arg | Leu | Ala |
|     |     |     |     | 350 |     |     |     |     | 355 |     |     |     | 360 |     |     |
| Lys | Leu | Ala | Gly | Gly | Val | Ala | Val | Ile | Lys | Val | Gly | Ala | Ala | Thr | Glu |
|     |     |     |     | 365 |     |     |     |     | 370 |     |     |     | 375 |     |     |
| Val | Glu | Leu | Lys | Glu | Arg | Lys | Asp | Arg | Val | Glu | Asp | Ala | Leu | Asn | Ala |
|     |     |     |     | 380 |     |     |     |     | 385 |     |     |     | 390 |     |     |
| Thr | Arg | Ala | Ala | Val | Glu | Glu | Gly | Ile | Val | Pro | Gly | Gly | Gly | Val | Ala |
|     |     |     |     | 395 |     |     |     |     | 400 |     |     |     | 405 |     |     |
| Leu | Leu | Arg | Ala | Ala | Pro | Ala | Leu | Asp | Lys | Leu | Lys | Thr | Glu | Asn | Gly |
|     |     |     |     | 410 |     |     |     |     | 415 |     |     |     | 420 |     |     |
| Asp | Glu | Ala | Thr | Gly | Val | Asn | Ile | Val | Leu | Arg | Ala | Leu | Glu | Ala | Pro |
|     |     |     |     | 425 |     |     |     |     | 430 |     |     |     | 435 |     |     |
| Leu | Arg | Gln | Ile | Ala | Glu | Asn | Ala | Gly | Leu | Glu | Gly | Ser | Val | Val | Val |
|     |     |     |     | 440 |     |     |     |     | 445 |     |     |     | 450 |     |     |
| Glu | Lys | Val | Lys | Asn | Ser | Glu | Ala | Gly | Gly | Tyr | Asn | Ala | Ala | Thr | Gly |
|     |     |     |     | 455 |     |     |     |     | 460 |     |     |     | 465 |     |     |
| Glu | Tyr | Val | Asp | Met | Ile | Ala | Ala | Gly | Ile | Ile | Asp | Pro | Thr | Lys | Val |
|     |     |     |     | 470 |     |     |     |     | 475 |     |     |     | 480 |     |     |
| Thr | Arg | Ser | Ala | Leu | Gln | Asn | Ala | Ala | Ser | Val | Ala | Ser | Leu | Met | Leu |
|     |     |     |     | 485 |     |     |     |     | 490 |     |     |     | 495 |     |     |
| Thr | Thr | Glu | Ala | Val | Val | Val | Asp | Lys | Pro | Glu | Lys | Glu | Ala | Ala | Pro |
|     |     |     |     | 500 |     |     |     |     | 505 |     |     |     | 510 |     |     |
| Ala | Gly | Met | Pro | Gly | Met | Met | Gly | Gly | Met | Gly | Gly | Met | Gly | Gly | Met |
|     |     |     |     | 515 |     |     |     |     | 520 |     |     |     | 525 |     |     |
|     |     |     |     | 530 |     |     |     |     | 535 |     |     |     | 540 |     |     |

Met  
545

(2) INFORMATION FOR SEQ ID NO:35:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 24 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

CATATGGCNG CNAAGAYGT AAAA

24

(2) INFORMATION FOR SEQ ID NO:36:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 24 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

TGATCACATC ATNCCNCCCA TNCC

24

(2) INFORMATION FOR SEQ ID NO:37:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 24 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

CATATGGCAA AAGAAATHAA RTTY

24

(2) INFORMATION FOR SEQ ID NO:38:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 24 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

TGATCANCCN CCCATNCCNC CCAT

24

(2) INFORMATION FOR SEQ ID NO:39:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 16 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

GTAAAACGAC GGCCAG

16

(2) INFORMATION FOR SEQ ID NO:40:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:

CAGGAAACAG CTATGAC

17

(2) INFORMATION FOR SEQ ID NO:41:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

CCAACCATCA CGAAAGA

17

(2) INFORMATION FOR SEQ ID NO:42:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

ACGGGTCACT TTGGTTG

17

(2) INFORMATION FOR SEQ ID NO:43:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

TTACTAATGA CGGGGTA

17

(2) INFORMATION FOR SEQ ID NO:44:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

TTACCAATGA CGGTGTG

17

(2) INFORMATION FOR SEQ ID NO:45:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

ACAGGGTCAA TGATTCC

17

(2) INFORMATION FOR SEQ ID NO:46:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

ACTGGATCAA TGATACC

17

(2) INFORMATION FOR SEQ ID NO:47:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:47:

CCGTACCGTG CTCTGAC

17

(2) INFORMATION FOR SEQ ID NO:48:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:48:

ACCACGTTTC AGATCCA

17

(2) INFORMATION FOR SEQ ID NO:49:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:49:

GACAGTTTCG CGGCAAC

17

(2) INFORMATION FOR SEQ ID NO:50:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:50:

CTCAGAACGA AGATCAG

17

(2) INFORMATION FOR SEQ ID NO:51:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:51:

GGTATGCAGT TCGACCG

17

(2) INFORMATION FOR SEQ ID NO:52:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:52:

CCGTGTTGGT CAAATCC

17

(2) INFORMATION FOR SEQ ID NO:53:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:53:

GGTAACTACG GTTACAA

17

(2) INFORMATION FOR SEQ ID NO:54:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:54:

GAGGCCACTT CTTTCAC

17

(2) INFORMATION FOR SEQ ID NO:55:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:55:

GGCTTCCAGC ACTGGCA

17

(2) INFORMATION FOR SEQ ID NO:56:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single



(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:56:

AACTTCAGTC GCAGCAC

17

(2) INFORMATION FOR SEQ ID NO:57:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:57:

CCTTGAAAGC CATTGCT

17

(2) INFORMATION FOR SEQ ID NO:58:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:58:

GCTACACGTG CAGCCGT

17

(2) INFORMATION FOR SEQ ID NO:59:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:59:

GCTGCAACAG GTGAGTG

17

(2) INFORMATION FOR SEQ ID NO:60:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:60:

TCATGAACAA TGGCTTG

17

(2) INFORMATION FOR SEQ ID NO:61:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:61:

ACGAAGCACA ATGTTAC

17

(2) INFORMATION FOR SEQ ID NO:62:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:62:

ATCACTAAAG ATGGTGT

17

(2) INFORMATION FOR SEQ ID NO:63:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:63:

GCAGTTGCCG CAGCAGT

17

(2) INFORMATION FOR SEQ ID NO:64:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:64:

GCTACTCGTG CAGCTGT

17

(2) INFORMATION FOR SEQ ID NO:65:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:65:

GTTCTCCGTG CTTTGGA

17

(2) INFORMATION FOR SEQ ID NO:66:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:66:

GCACCTGCTG TGACGTT

17

(2) INFORMATION FOR SEQ ID NO:67:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs

- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:67:

TCTTCGATGG TGATGAC

17

(2) INFORMATION FOR SEQ ID NO:68:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:68:

GGCAAGAGCT GTTCCGC

17

(2) INFORMATION FOR SEQ ID NO:69:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:69:

CTGAGCCAGT ACGGTTG

17

(2) INFORMATION FOR SEQ ID NO:70:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:70:

GTACTGCAGA GCGGAAC

17

(2) INFORMATION FOR SEQ ID NO:71:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:71:

ACCGTCTTCA ACGGTGA

17

(2) INFORMATION FOR SEQ ID NO:72:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:72:

GTTATCATTG CTGAAGA

17

(2) INFORMATION FOR SEQ ID NO:73:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:73:

ACGGTACCGC CGGTCAG

17

(2) INFORMATION FOR SEQ ID NO:74:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 17 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:74:

CTGGGCCAGG CTAAACG

17

(2) INFORMATION FOR SEQ ID NO:75:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:75:

CGACTGAAGT TGAAATG

17

(2) INFORMATION FOR SEQ ID NO:76:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:76:

GCTGTTGAAG AACTGAA

17

(2) INFORMATION FOR SEQ ID NO:77:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 17 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:77:

GTCTTCAACG GTGATCA

17

(2) INFORMATION FOR SEQ ID NO:78:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:78:

TCTTCTACCG CAGCACG

17

(2) INFORMATION FOR SEQ ID NO:79:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:79:

CTCTTGATTA TTGCGGA

17

(2) INFORMATION FOR SEQ ID NO:80:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:80:

TTGTTCAAAA CAAGAGT

17

(2) INFORMATION FOR SEQ ID NO:81:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:81:

CGATTATTGT AGAAGGT

17

(2) INFORMATION FOR SEQ ID NO:82:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:82:

CTTGATAACC GCAACAC

17

(2) INFORMATION FOR SEQ ID NO:83:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:83:

TCCAAAGCAC GGAGAAC

17

(2) INFORMATION FOR SEQ ID NO:84:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:84:

GTGTCAAACA TCCAAGA

17

(2) INFORMATION FOR SEQ ID NO:85:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single



(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:85:

TCTTCGATGG TAATCAC

17

(2) INFORMATION FOR SEQ ID NO:86:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:86:

GCAATAATGA GTAATGG

17

(2) INFORMATION FOR SEQ ID NO:87:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:87:

ACAGTAATTG TTGAAGG

17

(2) INFORMATION FOR SEQ ID NO:88:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:88:

CAGTGCAATA CGGTTAG

17

(2) INFORMATION FOR SEQ ID NO:89:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:89:

AGCTTCCAGA ACCGGCA

17

(2) INFORMATION FOR SEQ ID NO:90:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 17 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:90:

CTGATCATCG CTGAAGA

17

(2) INFORMATION FOR SEQ ID NO:91:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 16 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:91:

ACGGTTATTG TAGAAG

16